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Popular Mechanics

101 GADGETS

THAT *CHANGED*
YOUR WORLD

10 **BEST**
TABLETS
(AND E-READERS, TOO)

MEET THE TOP 10
WEIRD
CREATURES



< **TECH UNSHACKLED**
REALLY BIG >
MACHINES



WAR
GAMES
SHOOT FIRST,
WASH LATER



With **SO MANY cloud PROVIDERS** out there,
How do I **choose**
the **RIGHT ONE?**

Life as a **CFO** is never easy

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Let's see...

.....
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.....

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With a **COMPLICATED** supply chain

Our **BUYERS** travel throughout **Africa**

From **MOZAMBIQUE** to **NIGERIA**

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In a way that is **QUICK, AGILE** and **WORLDWIDE ANYWHERE**, anytime

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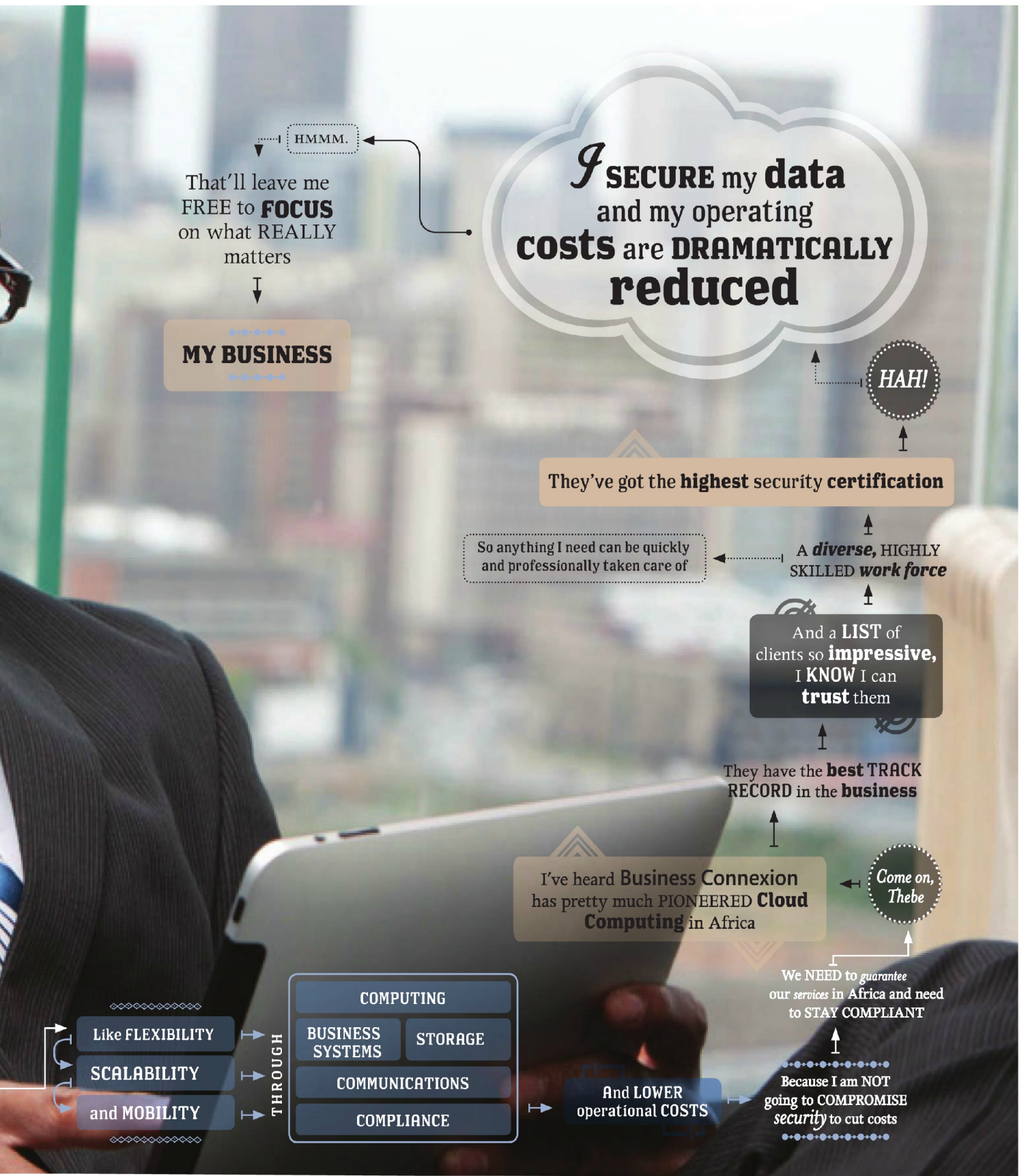
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I **NEED** a company that can **DELIVER** on the benefits that I **EXPECT**
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28

Cover: Of the millions of gadgets invented since 1800, a mere handful have emerged as profound cultural forces. In a joint project with HISTORY and a panel of experts, PM ranks the 101 most influential gizmos. Illustration by Dogo. This page: Inside the hell-raising Maserati Granturismo MC Stradale, an Italian aristocrat with formidable street cred.

WIN



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World-changing inventions: what about South Africa's Hall of Fame?

We expect this month's cover story to trigger a flood of e-mails, most of them expressing outrage at the absence of world-changing South African inventions in our US-sourced list of "101 gadgets that changed the world". What about the world-changing *dolos*?, we hear you cry. How about the Kreepy Krauly, the Tellurometer, the epithelial scrubber, the CyberTracker, the Hippo water roller, the Scheffel bogie, the computed axial tomography (CAT) scan, the Colindictor...?

Actually, that's where you come in. While we work on a follow-up article focusing on the local picture, you are cordially invited to submit (and rank from 1 to 10) your own suggestions for a list of Great South African Inventions, motivating each choice with a short paragraph. The devices need not be world-changing (you know, like the all-American SuperSoaker water pistol featured in August's issue), but if we like what you say – even if we disagree with your reasoning – we'll include it in our online update.

E-mail your list to aland@ramsaymedia.co.za with "Best SA Inventions" in the subject line, and please ensure we receive it by 15 August. If you have a special reason for nominating a particular invention, or have actually met the inventor, tell us about it. Our intention is to focus attention of South Africa's formidable inventive skills – past and present – in the run-up to **Invent 2011** (see details elsewhere in this issue) and the search for South Africa's Inventor of the Year.

Moving along, we acknowledge the huge surge of interest in tablets by expanding our earlier comparison table (July issue) into a showcase of the top 10 contenders, plus a couple of newcomers from left field (see "Great stuff, page 22). We also take a look at two leading e-readers, Amazon's hugely popular Kindle and Barnes & Noble's no less compelling Nook Color.

Many people are finding it difficult to keep pace in this vigorous market, which sees new and innovative tablets making their appearance with startling regularity. However, this is hardly a bad thing; it keeps the longer-established players (Apple, et al) on their technological toes and helps to maintain prices at reasonable levels.

Interestingly, not everyone is enamoured of touchscreens, and we know at least one frequent traveller who swears by his Atom-powered, Windows-equipped netbook. Either way, we continue to revel in the near-instant connectivity that keeps us in touch with our ever-changing world. Vroom!

Alan Duggan

aland@ramsaymedia.co.za

See-through aircraft. A radical cabin concept from Airbus.

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Page 46



Page 22

COMPETITION WINNERS...

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**Commercial
Vehicles**

WINNING
LETTER

ON A POINT OF ORDER

America has been a leader in many fields.

The South African version of **POPULAR MECHANICS** is testimony to this fact (I have read every issue cover-to-cover), but unfortunately, this is not the case on the automotive front, where their European (and recently) Japanese counterparts seem to have the edge. The recent article, "15 ways the Indianapolis 500 changed the way you drive" (June 2011 issue), is a case in point.

Grand Prix (later named Formula 1) is leaps ahead of Indy. Some examples:

Tyre tech – detachable rims were used in 1908 in the Italy GP. Michelin are not even mentioned, although they were the leaders at the time.

Superchargers and turbochargers – Fiat also introduced the supercharger in 1923.

Elevated curves – a steeply banked, egg-shaped near oval at Brooklands, England, was completed in 1907, four years before the Indy.

Four-wheel disc brakes – why not simply disc brakes?

Aerodynamics – F1 cars started using aerofoils in 1968 as opposed to the early 1970s (Indy).

The statement, "At Indy, we are the Nasa of the production car world", is thus incorrect. Keep up the good work

REG BARRY
PRETORIA

Editor's note: As far as we know, the first production car to feature disc brakes at all four wheels was the British-made Austin-Healey (in 1954). American Elmer Ambrose Sperry of Cleveland, Ohio, is credited with the invention of the spot-type disc brake in 1898.

Write to us, engage us in debate, and you stand to win a Kodak photo hamper valued at R1 998. Your prize includes a 12 Kodak Easyshare MP M550 digital camera (offering such cool features as facial recognition and one-button upload to YouTube, Facebook, Flickr, and Kodak Gallery sites... even e-mail) plus a P750 digital frame (with an energy-saving activity sensor that turns the frame off when you're away), a venture bag and an 8 GB SD card. For more information, call 011-202 8300 or visit www.kodak.co.za

Send your letter to: Popular Mechanics, PO Box 180, Howard Place 7450 or e-mail popularmechanics@ramsaymedia.co.za Please keep it short and to the point. Regrettably, prizes can be awarded only to South African residents.



Preserving air crash data

The tragic loss of Air France Flight 447 from Brazil to France two years ago got me thinking: why do we entrust critical flight data, including recorded cockpit discussions, to a box inside the plane in the expectation that it will be recovered if the plane falls from the sky? Were it not for the persistence of the Air France authorities who worked hard to fish out the black box, we might never have known what happened.

Can any aircraft engineer who reads PM please help me understand why, in this day and age of satellite communications,

why the goings-on inside the cockpit and the performance of a plane in flight cannot be immediately transmitted to the airline's corporate head office?

SAM CHUMA
JOHANNESBURG

Ded is dead, dude

Your article "Dead-reckoning footwear" (May issue) refers. I would like to point out that the correct term used to be "ded-reckoning", which is a shortened version of "deduced reckoning". Similar to what the shoes in the article do, the pilots of years gone by used speed, time

and landmarks to figure out where they were. Love your magazine.

LEON HOMAN
DURBAN

Editor's note: We're as pedantic as the next guy, but "dead reckoning" is actually the correct term. Check out this link to some scholarly research: <http://bit.ly/BAoqo>

Geography 101

In your June issue article, "Nor the sun by night", you refer to pilot Andre Borschberg taking off from "Payerne military airfield in France". Kindly note that the city of Payerne is not in France but in the heart of French-speaking Switzerland. This is a small mistake in an otherwise excellent magazine.

YVES MAZZON
VIA E-MAIL

Editor's note: Sorry about that. We don't like making mistakes, even small ones.

Show us your number

As a volunteer Basic Life Support Paramedic, I read your First Responder article (July issue) with great interest. It covered the many situations likely to be encountered by first responders in a very practical manner. However, one point you might have addressed is the difficulty faced by the emergency services in finding addresses. Your "1011 Basics" stressed the importance of giving your location, but very often houses are badly marked, making it difficult to provide help in time. It happens in all areas of Cape Town, and it would be hugely beneficial for homeowners to ensure their house number is prominently displayed. Numbers need to be large, close to the road and highly visible day and night. Thank you for an excellent magazine.

MATTHEW ROSENBERG
CAPE TOWN

Of iPads and apps

Recently, one of your covers caught my eye in the shops and my wife spoiled me with the issue. I took it home and opened it up, thinking I would have a quick scan. I put it down a couple of hours later, having scoured it thoroughly from cover to cover. I immediately decided I needed a subscription.

Moving forward a couple of months, my research into tablets was rewarded when my wonderful wife spoiled me (again!) with an iPad 2 for my birthday. One of the first things I did was look into getting my PM subscription on to my iPad. This proved a little more difficult than I'd imagined. I was eventually guided to your digital (flash) version and immediately downloaded the PDF, thinking this would be the way to read it on my iPad. I found to my dismay that no PDF reader app could

handle it (I am sure other readers have found this).

With the help of our company's IT guru, I think I've found the solution. I found PDF-notes (it's free, and works well). Open the PDF in Adobe Professional (if you don't have it, sorry!). Choose "reduce file size", save – and presto, you're ready to read your favourite mag on your iPad. I hope this helps other iPad and PM fans.

ANDREW TOUGH
FOURWAYS

Editor's note: We've found that the Zinio app for iPad is the best way to experience PM on the iPad. Not only does it provide a seamless viewing experience, but it easily stores your subscriptions in an easy-to-navigate archive. As for viewing PDF files on the iPad, we quite like the iBooks app.

Prize confusion?

I agree fully with Frikkie ("Change is fine, but not in this case"), as quoted in your July issue's Letters pages. Perhaps you can reprint some of those earlier articles, because some things never change, especially if they keep the old skills going.

Another thing: I would like to propose a change to your "Do it your way" (back page) hints competition. You feature a prize, but it's the one awarded for the previous month's entries, not the current month. I thought I had won a belt sander, which I needed, but received a jigsaw instead. That said, thank you for a wonderful magazine.

ROBERT COWLEY
DE LA HAYE

Editor's note: Point taken. We'll change the wording to avoid confusion.

Mobile comms: time to get real

Does any of the following sound familiar? "My smartphone integrates with social networking sites"; "Look at the new iPad 2... worth every penny!"; "I can carry my Netbook everywhere!". The list goes on. Of course, none of this is a bad thing. It does, however, become a bad thing when you consider that, as nice it is for us to be able to communicate with anyone, anywhere, at any time (well, almost any time), the same applies in reverse: anyone, from anywhere in the world, at almost any time they like, can get hold of us in some way.

This may not sound so terrible, but I think it is. We spend so much time thinking about other people, and how best to interact with them, that we forget about what matters to us. Analogue stuff. Real life. The problem lies in finding the balance between online and offline. Do you



A breath of hot air?

Every month, I count the days to the next issue of PM. It is informative and relevant, and if you are a subscriber, it competes with online publications for the latest technology news. I enjoy reading "Time machine", chuckling over the presumptions made of technology available in the year 2000, and in the same publication I go on flights of fancy that take in space tourism, integrated technology and medical cure-alls just beyond the horizon.

This is why I subscribe: PM delivers the facts and the fantasy that fuel my daydreams.

However, the Rolltop computer concept featured in your July issue ("Roll up, roll up!") is a pretty bad case of vapourware. Besides the fact that the design is poorly conceived, it is essentially hot air, and belongs in blogs and chatrooms. There's a fine line between fact and fantasy in the technology world, and I trust PM to differentiate between the two.

ALBERT WILLEMSE
CAPE TOWN

really, *really* need your e-mails delivered right now? If so, is this to please yourself, or your boss? How badly do you really need that time on Facebook?

When it comes to mobile communications, we need to separate "I-need-this-to-do-my-work" from "this-would-be-so-cool-but-is-of-no-consequence" – then go for a walk on the beach. Treat the family to a holiday.

Maybe I come across as old-fashioned, but I'm not. I am a 26-year-old male with a degree in electrical engineering who programs industrial systems for a living. I

have a Netbook, a BlackBerry and two laptops. I know that if I ever have kids, I don't want them to say, "Dad, I went outside today, and you know what? The graphics were great but gameplay sucked." If we don't lead by example, that's the kind of scenario staring us in the face in the not-too-distant future.

ANDRE J ESTERHUYSE
PORT ELIZABETH

Editor's note: In that case, our collective guilt knows no bounds. See our story on new tablets and e-readers in this month's issue.

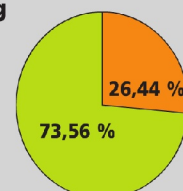
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MONTHLY POLL

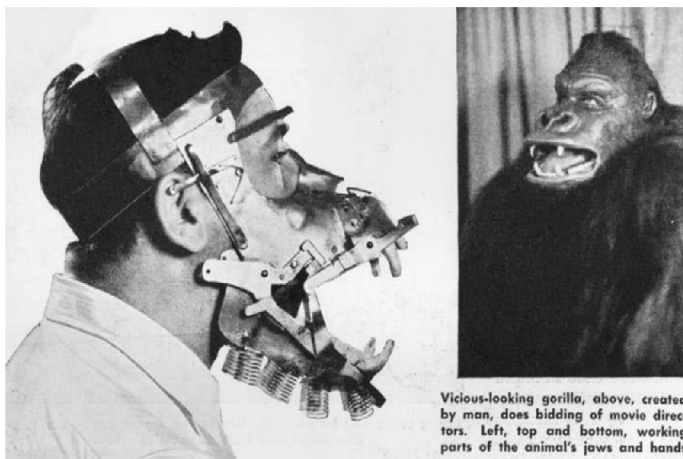
Virgin Galactic's SpaceShipOne was unveiled in '09. Now, hundreds of Virgin Galactic future astronauts are preparing to travel to space. Are you in?

Yes. I've always wanted to experience the view from space for myself. 73,56%

No. I prefer to have my feet planted firmly on Earth. 26,44%



Conducted online at www.popularmechanics.co.za – visit PM's Web site to vote in our current poll.



Vicious-looking gorilla, above, created by man, does bidding of movie directors. Left, top and bottom, working parts of the animal's jaws and hands

1941 Having failed to persuade gorillas to act in their movies, Hollywood studios resorted to custom-built "synthetic" animals. This scary-looking mechanical gorilla jaw was fashioned from duralumin, supplemented by steel springs and pinions.



1954 Breathless with excitement at the arrival of that new-fangled marvel, colour television, we invited PM readers behind the scenes inside a TV studio. This photograph shows a cameraman focusing on a girl posed beside a "colour wheel" used to adjust the camera.

1968 At a time when relations between Russia and America were distinctly frosty, PM published an extract from a book recounting the attempt by a "lonely" US Coast Guard icebreaker to traverse the Northeast Passage across the top of Russia and Siberia. The vessel turned back after the US State Department capitulated to Soviet protests. **PM**



1938 This coal-burning locomotive, designed for the New York-Philadelphia business run, was clad in highly polished stainless steel with the intention of preventing soot and stray cinders from soiling its elegant flanks.



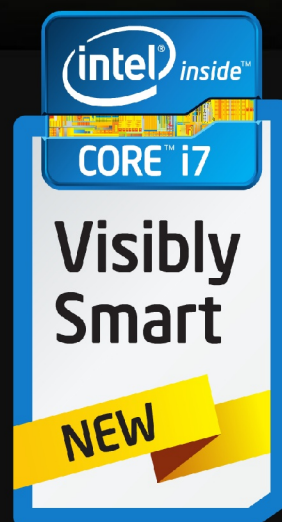


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GREENHOUSE EFFECT

Greenhouse ocean study offers warning for future



Martin Kennedy

The mass extinction of marine life in our oceans during prehistoric times is a warning that the Earth will see such an extinction again because of high levels of greenhouse gases, according to new research by geologists.

Professor Martin Kennedy of the University of Adelaide and Professor Thomas Wagner of Newcastle University have been studying “greenhouse oceans” – oceans that have been depleted of oxygen and suffered from increases in carbon dioxide and temperature.

Says Kennedy: “Our research points to a mass mortality in the oceans at a time when the Earth was going through a greenhouse effect, with high levels of carbon dioxide in the atmosphere, and rising temperatures, leading to a severe lack of oxygen (hypoxia) in the water that marine animals are dependent on.

“What’s alarming to us as scientists is that there were only very slight natural changes that resulted in the onset of hypoxia in the deep ocean. This occurred relatively rapidly – in periods of hundreds of years, or possibly even less – not gradually over longer, geological time scales.

“If you consider that the amount of carbon dioxide in our atmosphere could double over the next 50 years, this will be like hitting our ecosystem with a sledgehammer...”

● Source: University of Adelaide



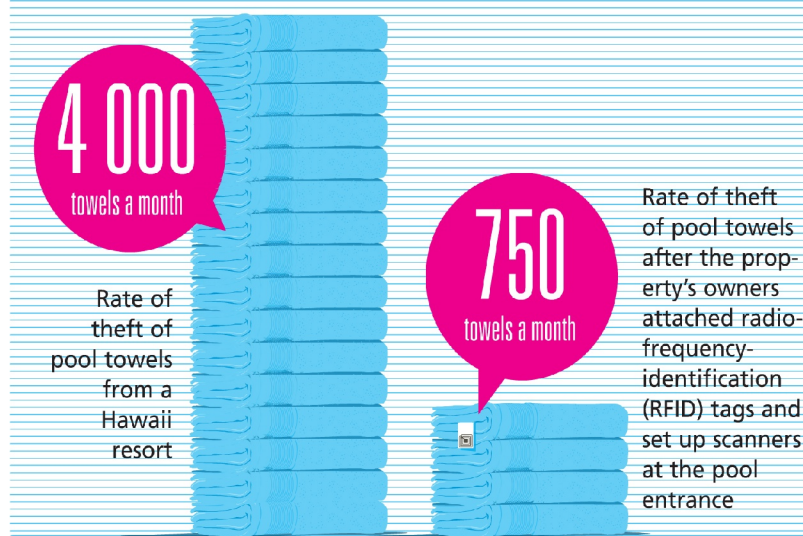


A breath of fresh air

Researchers have provided new insights into how a species of air-breathing spider can spend its whole life under water, only venturing to the surface occasionally to replenish its air supply.

The "diving bell spider" (*Argyroseta aquatica*) is the only spider that lives entirely under water. It breathes air, which it traps in a dome-shaped web suspended between aquatic plants. It's this bubble that gives the spider its name – and we now know how it works. The scientists found that the "diving bell" behaves like a gill, extracting oxygen from the water. The spider needs to dash to the surface only once a day to supplement its air supply, and it can stay under water for more than 24 hours. Says Professor Roger Seymour of the University of Adelaide: "Being able to stay still for so long, without having to go to the surface to renew the air bubble, protects the spiders from predators and also keeps them hidden from potential prey that come near."

● Source: University of Adelaide



THE OWNERS OF THE RESORT, WHO DECLINED TO BE IDENTIFIED, SAY THEY ALSO INSTALLED RFID TAGS ON ITS SHEETS SO THEY CAN TRACK BED-LINEN INVENTORY.

QUICK HITS

NATURAL POWER

→ Researchers at MIT claim to have invented the first practical "artificial leaf". The playing-card-sized device, when placed underwater in direct sunlight, splits water molecules into oxygen and hydrogen, which could then be stored in a fuel cell to produce electricity. A single leaf, already 10 times more efficient at cleaving H₂O than a real one, should provide enough daily power for one house in the

developing world. Unlike previous artificial leaves, the new one utilises inexpensive materials: silicon plus nickel and cobalt catalysts.

Considerable challenges remain, though, including figuring out how to capture the gases.

– ALEX HUTCHINSON

BRAVE, CLEAN AND ROBOTIC

→ The Boy Scouts of America recently released a new merit badge in robotics. Scouts must design,



build and demonstrate their own robot to earn the badge, which displays one of Nasa's Mars rovers. "I think it's awesome," Steve Squyres, the scientific principal investigator for the Mars Exploration Rover mission, tells PM. "Now we know we've arrived."

– JOE PAPPALARDO

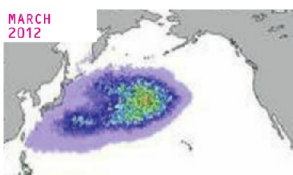
A PUNCHING BAG THAT HITS BACK

→ An amateur inventor in Australia has created a training robot for boxing that can dish it out as well as it can take it. The humanoid Punching Pro uses three 12-volt windscreen-wiper motors to throw punches at a boxer. The robot can hook and jab at several speeds, or it can go into "berserk" mode by adding an extra axis of rotation to the attacks. Creator Kris Tressider hopes to turn the prototype into a commercial product retailing for less than \$1000 (about R7 000). – AH

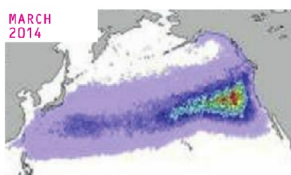
MARCH 2011



MARCH 2012



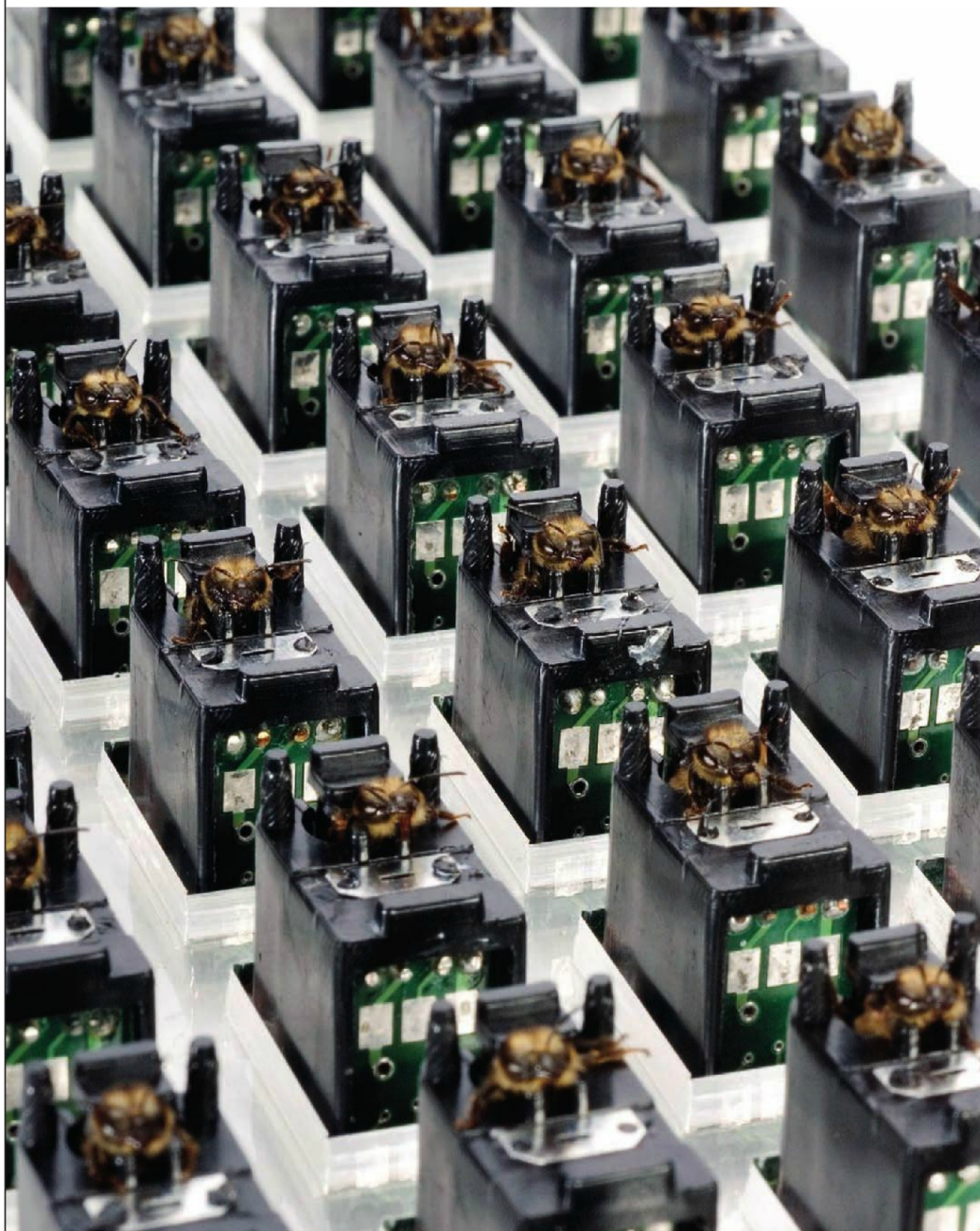
MARCH 2014



THE LONG REACH OF A TSUNAMI'S FLOTSAM → The debris washed into the ocean by Japan's devastating tsunami is drifting across the Pacific Ocean. Researchers at the University of Hawaii, Manoa, using data compiled from research buoys, calculate that the first pieces will reach Hawaii next year, but it will take until 2014 before the wreckage arrives on the West Coast of North America. – AH



DRONE LIFE: Like workers in cubicles, honeybees trained to respond to the scent of explosives take a shift as sensors in a prototype detector.



■ EMPLOYMENT FOR INSECTS **Bees vs bombs**

SOME RESEARCHERS ARE WILLING TO ENLIST STRANGE ALLIES in the quest for public security. Inscentinel, a startup company funded by the British government, created a bomb-detection device that uses 36 honeybees to sniff out explosives. First, the bees are trained to associate the scent of common explosive compounds, such as Semtex, TNT and C4, with food. (The training takes only minutes.) The team of bees is then attached to tiny sensors. Each bee holder faces an infrared LED. If a bee detects explosives, it extends its proboscis to feed, essentially sticking its tongue into the IR beam. If enough bees do this at the same time, it triggers an alarm. The company's prototype, a handheld device about the size of a DustBuster, reportedly outperformed current detection technology in British tests, picking up vapours with part-per-trillion sensitivity. Company officials say the bees are returned to their hive after their shift. – ALEX HUTCHINSON

■ POWER OF LIGHT

Laser beam telegrams

➔ Forget fibre optics – the quickest way to send large amounts of data over long distances is through the air with a laser. In principle, laser beams bounced off an orbiting satellite could send 100 gigabytes of data per second and reach anywhere on Earth – or the solar system. Although all previous attempts to create free-space optical communication systems have encoded information by varying the intensity of the laser – amplitude modulation (AM) – scientists at Stevens Institute of Technology in New Jersey recently figured out how to send data by varying the frequency of the laser. This frequency-modulating (FM) signal is less sensitive to disruptions from fog, dust and rain. The researchers are now seeking ways to increase data speed. (See “Tangling with tele-coms”, July 2011).

Picture by Rothamsted Research

MARINE FORENSICS



Plumbing the depths of disaster

AIR FRANCE FLIGHT 447 disappeared off the Brazilian coast in June 2009 with 228 people on board, leaving little but questions behind ("Anatomy of a Plane Crash," January 2010). French aviation authorities needed to find the wreckage, especially the plane's black boxes, to figure out what happened. Only problem: the impact site lay somewhere beneath a 150-kilometre-wide expanse of ocean.

The French called on their military and international oceanographic researchers to deploy submarines and an array of remotely operated vehicles. But the most powerful subsurface assets proved to be three Remus 6000 autonomous underwater vehicles, or AUVs. These torpedo-shaped robots can travel up to 22 hours at a stretch, systematically scanning the seabed with sonar that images a kilometre-wide swath with every pass. "The only way you're going to be able to find an aircraft in deep water is by using this type of wide-area survey capability," says Dominique Rissolo, executive director of the Waitt Institute, the nonprofit organisation that owns two of the AUVs used in the search. After two years of on-and-off searching, AF 447 remained lost. So the authorities revised simulations of ocean currents and looked in a new area. Just a week after reaching the new search zone, a Remus AUV launched from the vessel Alucia (below) found the wreckage, 4 000 metres down. — JEFF WISE

THE SEARCHERS

Here are three submersibles that took part in the hunt for the doomed Airbus A330-203:

EMERAUDE

Type: French nuclear-powered attack submarine

Maximum rated depth: 500 metres

What it did: Listened for pinging of black box acoustic beacons

Sensors used: Hydrophones, sonar

REMORA 6000

Type: Remotely operated vehicle

Maximum rated depth: 6 000 metres

What it did: Recovered black boxes

Sensors used: Scanning sonar, CCD camera

REMUS 6000

Type: Autonomous underwater vehicle

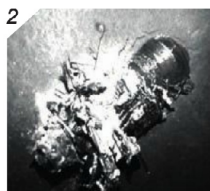
Maximum rated depth: 6 000 metres

What it did: Searched and identified wreckage on the seafloor

Sensors used: Side-scan sonar, camera with strobe



In April, the cameras of the Remus 6000 (1) first spotted AF 447's wreckage (2). Soon after, a Remora 6000 underwater robot (3) found and recovered the flight data recorder (4).

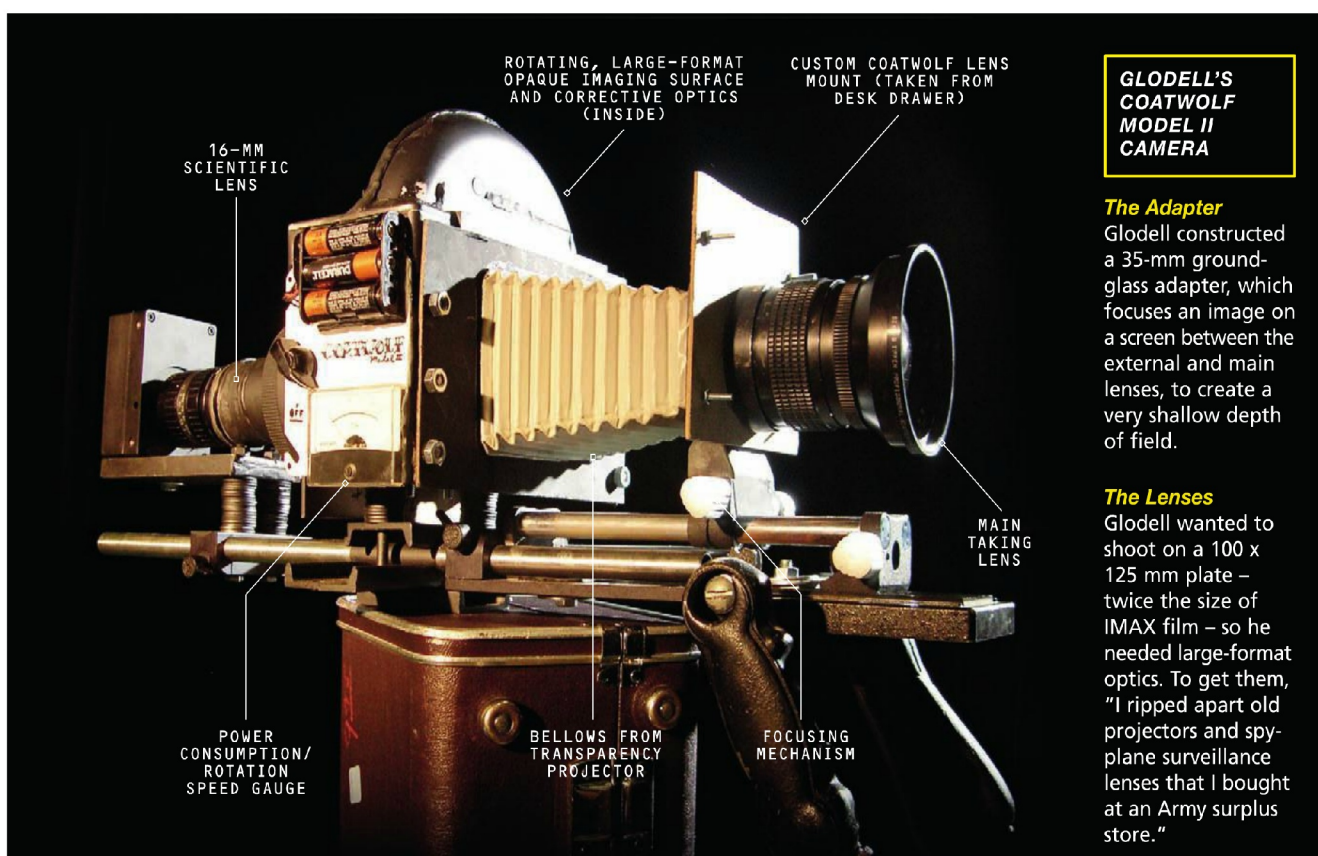


MARINE FORENSICS

Lifesaving wizardry



➔ Harvard University chemists are fighting fire with electricity. Building on the knowledge that electric fields can affect the shape of flames, researchers connected a wand to a 600-watt amplifier – comparable with a car stereo system – and experimented with ways to manipulate a 30 cm-high blaze. The device's electric fields subdue or bend the fire by attracting or repelling carbon soot particles, electrons and ions inside the flames. The researchers envisage portable electric fire extinguishers that can carve escape routes for victims, and ceiling-mounted systems that can suppress flames without damaging rooms with water or foam. – AH



GLODELL'S COATWOLF MODEL II CAMERA

The Adapter

Glodell constructed a 35-mm ground-glass adapter, which focuses an image on a screen between the external and main lenses, to create a very shallow depth of field.

The Lenses

Glodell wanted to shoot on a 100 x 125 mm plate – twice the size of IMAX film – so he needed large-format optics. To get them, "I ripped apart old projectors and spy-plane surveillance lenses that I bought at an Army surplus store."

Extreme close-up

When it came time for Evan Glodell to direct his first feature film, *Bellflower* – about two Mad Max-obsessed friends who prepare for the apocalypse by building flamethrowers and battle-ready cars – he wanted to shoot on a large-format camera, one so big that it didn't yet exist. So he constructed it himself. "I've built things my whole life – I can't help tinkering," says Glodell, who also wrote and starred in the film. It took him a month of R&D to build his 8-kilogram camera, the Coatwolf Model II. Glodell's only training was a week of engineering classes in university, but that didn't deter him: he also built *Bellflower's* flamethrowers and turned a 1972 Buick Skylark into the film's fire-breathing Medusa-mobile (right). "I never stop building," he says. "It seems like it happens naturally." – ERIN MCCARTHY



The effect

"There was this huge trial-and-error process," Glodell says of the camera. "I kept switching parts until I got something that looked cool." The resulting shots – some tilt-shifted, some partially blurred and some narrowly focused – give *Bellflower* a unique cinematic look.

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NEWS ANALYSIS

Spies at war

IN RESPONSE TO THE ATTACKS ENGINEERED BY OSAMA BIN LADEN, THE CIA LAUNCHED A NEW ERA OF AGGRESSIVE ACTION. THE CHANGES BIN LADEN TRIGGERED KILLED HIM – AND WILL ENDURE.

– JOE PAPPALARDO

The killing of Osama bin Laden

was a seminal moment for the Central Intelligence Agency. Now, with the successful completion of the mission, there is heightened public debate about the changes within the agency that led to bin Laden's death.

Officials say it took 45 minutes to conduct the raid that killed bin Laden. Actually, his violent demise began the week after 9/11. On September 17, 2001, the White House authorised the CIA to conduct "targeted killings" of al-Qaeda personnel, overriding the ban on political assassination first approved in 1976 by President Ford. Later in 2001, the US Congress also signed off on this approach by declaring war on al-Qaeda. The dual policy shifts meant a new, violent role for the CIA. Al-Qaeda was agile and transnational, and so the hunters had to be as well.

After nearly 10 years of conflict, the CIA attacks militants wherever the White House chooses. Missile attacks by CIA-operated unmanned aerial vehicles in Pakistan are now fairly routine, and the method has been applied in Yemen and Somalia. Snatch-and-grab renditions span the globe, as do secret facilities where detainees are

interrogated. This is, indeed, a new kind of war. "What you're seeing now is an evolution, and it's predicated on the threat environment we face," says Frank Cilluffo, former White House special assistant to the president for homeland security. "During the Cold War, it was spy versus spy. There were some small, hot wars, but it was country on country. The threats today are very different."

The CIA has authorisation to kill people, but it doesn't have a deep bench of trigger pullers on its payroll. In the past the agency hired proxies, either local fighters or contractors, to conduct some operations, but there are missions too difficult and vital to delegate to hired hands. At such times, the CIA uses experts from the Joint Special Operations Command. The team that killed bin Laden, the Naval Special Warfare Development Group (Team Six), was formed to rescue hostages, not conduct targeted killings. But the skill sets overlap.

The relationship between the CIA and the special-ops community has never been closer, thanks in part to shared operational experiences in Afghanistan and Iraq. But this comfortable collaboration

has drawbacks, especially among the super-secret military units that operate within the CIA's more tolerant culture. In 2009 the USA's Congressional Research Service noted that the agency's covert operations "can often be contrary to international laws or laws of war that US military personnel are generally expected to follow". In 2005, a Navy SEAL was court-martialled for his role in the death of a CIA detainee during interrogation in Iraq. The SEAL was acquitted. CIA personnel were not even named.

This mission was high-risk; don't expect similar raids to end equally well.

There are good reasons why the CIA handles the vast majority of its covert killings in its war on terror by firing missiles from unmanned aircraft: These attacks are lethal and one-sided. They bring war to the enemy leadership hiding in ungoverned areas of Pakistan, not just footsoldiers who cross the border into Afghanistan.

But CIA airstrikes also cause civilian casualties that incite the Pakistani population and inflame domestic backlash. The alternative, face-to-face gunfights, risks operator lives and the exposure of the US government's actions. The bin Laden operation, one of the most meticulously planned in black-ops history, was jeopardised when a helicopter crashed. "These are complex missions," Cilluffo says. "And then there's serendipity."

A militarised CIA may come at a price.

The Obama administration's selection of General David Petraeus to head the CIA reflects the close relationship between the CIA and the military. While some say Petraeus is the right choice for that reason, others worry about an overall loss of focus. The fear is that long-term strategic analysis may be sacrificed for short-term tactical information to be used against terrorists. "You hear it from intelligence analysts when you interview them," says Jennifer Kibbe, who studied the issue in the journals *Foreign Affairs* and *Strategic Intelligence*. "They are too busy with what's happening right now to focus on what's coming down the (turnpike)."

It was just such a lack of strategic thinking that blinded agency personnel to the threat of spectacular terrorist strikes against the US homeland – which bin Laden exploited in 2001.

PM

Now you don't need to leave home without a Leatherman on your keys

STYLE: CUTE AND CLEVER ARE NOT MUTUALLY EXCLUSIVE

The Style keychain tool from Leatherman is no bigger than your house key and weighs even less. But don't be fooled by its size. This little survival tool has four great features for everyday situations and not-so-everyday emergencies. You want to carry less and the Style lets you do that without sacrificing versatility.



SQUIRT PS4

SQUIRT PS4: WHO SAYS YOU CAN'T HAVE IT ALL?

For years our customers had to choose between the handy little pliers on the original Squirt P4 or the scissors on the Squirt S4. Now you can have both in one lightweight mini-tool that comes in handy for everything from snipping fishing line to wrapping a birthday present on the go.



SQUIRT ES4: NO NEED TO GET CROSS WITH YOUR WIRES

The Leatherman Squirt ES4 is one handy and unique key-chain size multi-tool. The E4 sets you up with 20GA, 18GA, 16GA, 14GA and 12GA wire strippers and electrical wire cutters to handle all kinds of precise jobs. The gripping edges on the ES4's spring-action pliers help you get a firm grasp on fuses, small cables and many hard-to-reach items.



STYLE CS

STYLE CS: YOU SHOULD NEVER SACRIFICE FUNCTION

The handy Style CS is one unique clip-on multi-tool. With spring-action scissors, a file, knife, tweezers, bottle opener and mini-screwdriver, you'll never be without your most necessary tools. Fits in a pocket or clips on your pack or bag for easy portability. So stylish it's almost a shame it fits so easily in your pocket.



LEATHERMAN & LED LENSER are distributed by **Awesome Tools**

Tel: 021 981 6672 <> Fax: 021 981 6730 <> E-mail: sales@awesometools.co.za <> Website: www.awesometools.co.za

The LED Lenser **Automotive** is a miniature LED torch which is recharged by plugging into the cigarette lighter of a car. The simple design is made from polished high-grade steel, bright LED technology and a glass lens. These nifty torches are really useful, no bigger than your thumb they fit discreetly into the cigarette lighter socket to recharge and only need recharging after 2 or so hours of use.

Automotive



Features

Rechargeable: up to 1000 times
Run Time: Up to 3 hours light per charge
Dimensions: 47mm x 20mm
Weight: 44gms

The LED Lenser **P5R** is small, lightweight, an energy-saving marvel and at the same time a giant of brightness. In spite of its light weight it generates the light output of a spotlight! A light beam shoots from the high-precision reflector-lens and its light architecture can be adjusted as desired using the Speed Focus. The lamp operates using a rechargeable lithium-ion battery. The battery on the LED Lenser P5R can be recharged up to 1,000 times using the included charger.

Features

Operating Modes: Off / Low / High / Signal / SOS / Strobe
Output: 210 Lumens
Beam Range: 190m
Run Time: 7 hours
Overall Length: 117.5mm
Weight: 80 Grams



P5R

When it comes to performance, features and functionality there is hardly anything comparable. The focus quality, the illuminating power and the optimised user ergonomics of the LED Lenser **M7R** have yet to meet their match. All the benefits of the M7 were married to the comfortable Floating Charge System – one of the most advanced charging systems of our time. The operational time has almost doubled and the intelligent illumination control of the Smart Light Technology predestines this torch for use in professional, every-day situations.

Features

Operating Modes: Off / Low / High / Signal / SOS / Strobe
Luminous Flux: 220 Lumens
Beam Range: 255m
Run Time: 20.5 hours
Overall Length: 206mm
Weight: 210 Grams



M7R

GREAT STUFF

From home improvement to outdoors, wheels to electronics, here's the newest gear you'll want to own.

COMPILED BY SEAN WOODS
seanw@ramsaymedia.co.za

CHIP OFF THE OLD BLOCK ↓

In celebration of a legendary can-do vehicle's 60th anniversary, Lego has teamed up with Mercedes-Benz to create a 1:12.5 scale model Unimog U 400 comprising a whopping 2 048 elements. That makes it the largest Lego Technic model the company has ever created.

A true adaption of the original, down to the smallest details, it combines an electric drive and pneumatics to work like the real thing. Its so-called "Power Functions" run the pump of the pneumatically operated crane, with a gripper arm that can rotate almost 360 degrees. There's also a serviceable

control system and an engine accurate in minute detail – right down to the pistons.

The model's gear unit provides good ground clearance, just like the portal axles in the original. Independent suspension deadens jolts, and its four-wheel drive guarantees mobility off-road as well. Plus, the crane and winch can be converted into a huge snowplough. Price: about R2 650. Orders can be placed at any Mercedes-Benz dealer. Visit www.mercedes-benz.com





CAPTURE YOUR WORLD ↑

Magic moments happen when you least expect them. That's why it makes sense to keep Casio's latest compact camera, the Exilim EX-H30, close at hand. Its long battery life allows you to capture about 1 000 images per charge. With a 16-megapixel sensor, 12.5x optical zoom (24 – 300 mm 35 mm equivalent) and shift image stabilisation, if you miss the action... it's your fault.

You also get a slide panorama mode that makes capturing wide vistas a breeze, HD video recording, and a silent mode for instances when flash or shutter noise could be a distraction. Casio's unique 36 Best Shot scenes can tailor your settings to virtually any shooting situation. Alternately, you can use full manual exposure, shutter-priority automatic exposure or aperture-priority exposure. Price: about R3 000. Contact Distributor James Ralph on 011-314 8888 or visit www.jamesralph.co.za



CAN'T WATCH THIS ↑

Okay, so you're one of those lucky individuals who have everything, and money's no obstacle, right? Well, you deserve to spoil yourself with Bang & Olufsen's giant BeoVision 4 213-cm HD 3D plasma TV.

Designed to provide the ultimate TV or home cinema experience, this full HD telly (if you can call it that) delivers razor-sharp details, rich, lifelike colours and smooth movement on its massive screen. A dedicated centre loudspeaker utilises acoustic lens technology to deliver sound performance that complements the screen. In addition to this, its automatic colour management system is said to counter the effects of age, ensuring the same high level of performance year after year.

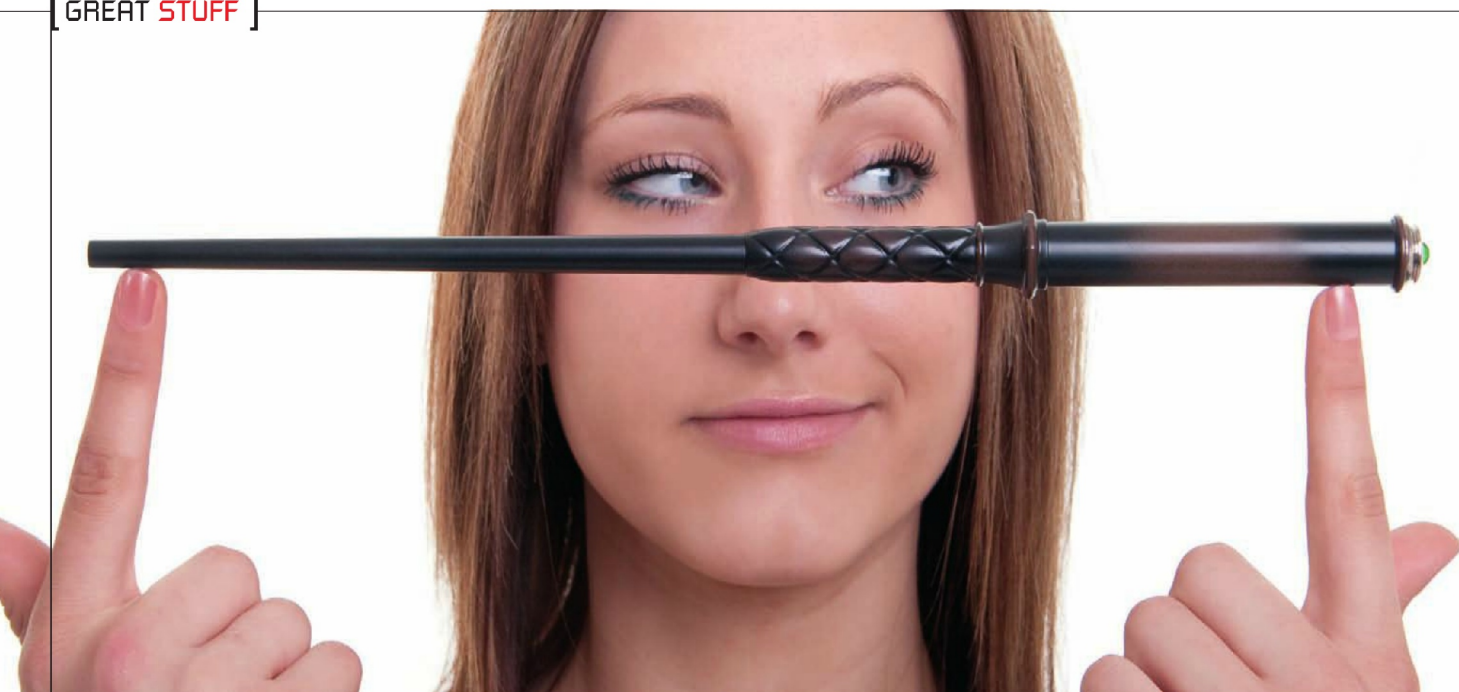
As an extra, you can also get a unique stand that automatically elevates the screen from the ground and tilts it to your preferred viewing angle. Once switched off, the stand then lowers the TV to the floor, making it less obtrusive. Price: a mere R574 000. Contact Bang & Olufsen on 021-418 1385 or visit www.bang-olufsen.com



SHAKE IT UP ↑

Plugging headphones into your head and getting on to your bicycle or skateboard is a pretty isolating (not to mention dangerous) experience. Fortunately, the Tunebug Shake – a nifty ultra-portable sound generator you can mount on a bike or skateboard helmet – allows you to enjoy your good vibes while on the move, without the risk.

It connects to iPods, MP3 players, mobile phones and the like via a 3,5 mm audio cable or Bluetooth. It's also water resistant, features a lithium polymer rechargeable battery that's good for about 5 hours of play, and touch-sensitive volume and on/off controls. Price: about R1 400 (plus R25 for packaging and postage). Visit www.tunebug.co.za



ABRACADABRA ↑

Spin back to the Middle Ages and it's likely you'd have been burnt at the stake for using the Kymera Wand. Besides, you wouldn't have had a cool plasma screen to control in the first place. This seemingly magic remote is capable of controlling your TV, hi-fi, DVD player and even remote control light switches and curtains – anything with an infra-red interface.

Totally button-free, it can "learn" up to 13 infrared codes, allowing you to assign various functions to various moves. Examples: flick to turn your chosen device off and on, spin to control volume, big

swish to mute, and so on. Green tech is built in: it goes into sleep mode after a minute's inactivity and automatically wakes when you pick it up.

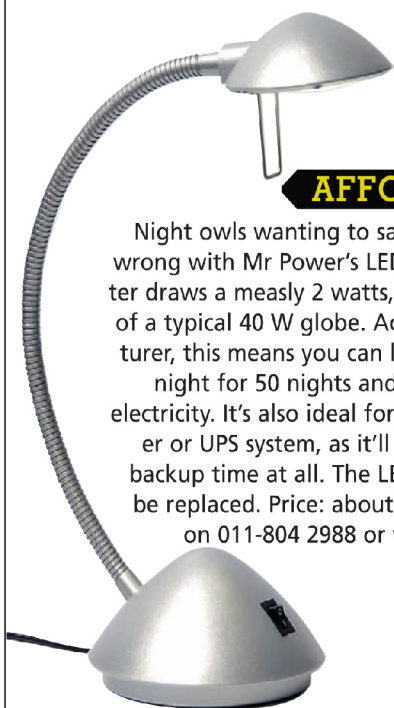
The Kymera's three-axis accelerometer measures g forces in any direction. Its onboard microprocessor combines this information with constantly updated data on the wand's orientation

to compute how it is being moved about. Price: about R800. Contact Mantality on 0861 626 825 or visit www.mantality.co.za



AFFORDABLE LIGHT

Night owls wanting to save on electricity can't go wrong with Mr Power's LED desk lamp. Its LED cluster draws a measly 2 watts, but pushes out the light of a typical 40 W globe. According to the manufacturer, this means you can leave it on for 10 hours a night for 50 nights and only spend about R1 on electricity. It's also ideal for connecting to an inverter or UPS system, as it'll hardly affect the battery backup time at all. The LED cluster never needs to be replaced. Price: about R225. Contact Mr Power on 011-804 2988 or visit www.mrpower.co.za



GIVE IT A WAVE

Gamers and couch potatoes alike are bound to appreciate Acer's latest all-in-one 3D desktop PC, the Aspire Z5763. Its Blu-ray Disc optical drive allows you to watch 3D movies or enjoy 400 game titles that support full stereoscopic 3D. The 58 cm display is equally good for detailed 2D visuals. That stunning image quality is matched by an integrated 5W stereo speaker system and Dolby Home Theatre v4 for captivating audio.

AirControl, a sophisticated software solution that uses cameras to detect movements of your hand and fingers, allows you to adjust the volume, rewind or fast-forward, or play and stop content with a simple hand motion.

Other features include 802.11b/g/n Wi-Fi, Gigabit LAN and optional Bluetooth 2.1 connectivity, up to 2 TB of capacity and up to 8 GB of DDR3 memory. Prices start at around R14 000. Visit www.acer.co.za





BACK PAIN, BEGONE ↑

Even mild back pain has the potential to ruin your enjoyment of life. Fortunately, the Dynaspine provides aching sufferers with a handy solution. Its unique design involves two flexible plates that conform to the shape of your spine and encourage movement while seated.

Benefits include a reduction of pressure on your spine (because the position of your hips has been moved forward) and less pressure on the spinal discs and joints, minimising muscle fatigue. As it's fully portable, you can use it in the garden, in your car or at work, and air vents prevent your back from getting hot and sweaty. Price: about R900. Contact Medsport on 021-426 2378 or visit www.medsport.co.za



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STAY IN TOUCH →

Whether you're at a birthday party or on a business trip, Logitech's latest portable HD webcam, the C615, will always make sure you stay in touch with colleagues, family and friends. It facilitates video calls in HD 720p on Skype, FaceTime for Mac and Windows Live Messenger, to mention but a few. It includes one-click HD video and photo upload to Facebook, YouTube and Twitter so you can share all your video recordings. For extra flexibility, there's a 90 cm USB cable with an extender. The C615 features a tripod-ready design, so you can capture your world from virtually any vantage point. Price: about R1 150. Visit www.logitech.com

**LADIES, WATCH YOUR TICKER** ↓

In winter, inactivity and a deep-seated genetic imperative combine to make creatures of all kinds (humans included) stock up on the body fat stores. Rightly or wrongly, the female of the species is regarded as being somewhat more sensitive to this situation. That has prompted Oregon Scientific to create a range of workout-optimising heart rate monitors for women who are intent on burning some extra kilojoules at the onset of summer.

The SE331 monitor is coded with a wireless chest belt (supplied) to transmit accurate heart rate data to the watch. It also displays your calorie consumption and fat burnt level. The SE332 monitor utilises ECG (electrocardiography) technology to liberate you from wearing a chest belt for a more comfortable workout. All you have to do to monitor your heart rate is place a finger on the lens sensor, which will tell you all you need to know. Expect to pay about R800 for the SE331 and R700 for the SE332. Contact Radio Holland on 011-805 1996 or visit www.oregonscientific.co.za

**CHEERFUL LITTLE MUSIC MAKERS**

We've become accustomed to hearing music emanate from something shaped more or less like a box. But there's no reason that, with modern technology, we shouldn't think out of the box. The Mobi Headphonie portable speaker, inspired by urban vinyl figures already popular overseas, features stout humanoid shapes with oversized heads. Each character is unique.

Even though they stand only 8 cm tall and weigh about as much as Jiminy Cricket, they're described as extremely powerful. Microspeakers (situated at the back of their heads) are driven by amplified digital signal processor (DSP) circuitry to provide clear bass and frequency response that pumps out music in tight detail, without the distortion that usually plagues portable speakers.

It takes an hour to recharge their internal batteries, after which they're good for up to six hours of playback. To save energy, they automatically power down when not in use. Price: about R200. Contact Gammatek on 011-201 0800 or visit www.gammatek.co.za



HIGH-DEF HOME MOVIES ON A BUDGET

Looking for an affordable big-screen experience? Then look no further than Epson's EH-TW3600 1080p projector. Pitched as easy to use and install, it makes an affordable high-definition display for gaming, watching sports or a home cinema.

Powered by Epson's 3LCD technology, it's said to deliver smooth, lifelike images with superb brightness and definition. And there's no need to draw the curtains, even in daylight, thanks to a high white and colour light output of 2 000 lumens. Price: about 15 000. Contact Epson on 011-465 9620 or visit www.epson.co.za PM



TABLETS FROM LEFT FIELD...



Best of both worlds? Meet Dell's Inspiron Duo Tablet, featuring a 10,1-inch multitouch screen, an Atom Dual N550 1,5 GHz processor, 2 GB of DDR RAM, a 1,3 MP Webcam, and – wait for it – a 320 GB hard drive. It's loaded with Windows 7 Home Premium, and when we last checked, it was available for around R6 300 (plus R1 300 for the optional docking station).

New from China is the Huawei MediaPad, billed as the world's first 7-inch Android 3.2 Honeycomb tablet. It's driven by Qualcomm's dual-core 1,2 GHz processor, supported by Huawei's Hi-Space cloud solution and Google Android Market, and it comes in a slim (just 10,5 mm thick) and

stylish package. Specs include 1080P full HD video playback, a 1,3 megapixel front-facing camera and 5 megapixel autofocus rear-facing camera (with HD video capability), and high-speed WiFi 802.11n Internet connectivity.

● Also see "Tablet wars: Round Two (Page 46).



HUAWEI

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CANDLESTICK
ERA, 1900 TO
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HANDSET ERA, 1930
TO 1965



101 GADGETS

THAT CHANGED THE WORLD

The answering machine edges out the sewing machine. The electric guitar trumps the electric toothbrush. But from alarm clock to zipper, all of the items on our list have cultural significance that belies their physical size. Ground rules: A gadget is something you can hold in your hands. Mechanical or electronic, it is a mass-produced, personal item that evolves from novelty to necessity and ultimately shows its paradigm-shifting power. All were selected and ranked by PM, HISTORY and a panel of esteemed inventors, designers and tech gurus, including a moon-walking astronaut. Let the countdown – and the inevitable debate – begin.



1. MOBILE/SMARTPHONE

The judges argued over all but one ranking: the smartphone was an easy top pick. With origins tracing back to Finland and Japan in the '70s, mobile phones have fast become the most widely used gadgets in the world. The first billion units sold in 20 years, the second billion in four years and the third billion in two. By the end of 2010, the subscription rate stood at 5 billion, or 3 of every 4 people on Earth. The tech leapt forward in 1983 with the Motorola DynaTAC 8000X, the first truly portable cell-phone. The smartphone, with us since 2000, is now a pocket-sized PC. Wireless and GPS- and multimedia-enabled, it facilitates instantaneous personal connections that make phone conversations seem like cave paintings. People of developing nations, even those without an electrical grid, can tap into the world's commerce and culture. After a scant 11 years of development, the device seems to have limitless potential.

CELLPHONE ERA,
1983 TO PRESENT

SMARTPHONE ERA,
2000 TO PRESENT

BY THE EDITORS

PICTURE BY JAMIE CHUNG

STYLING BY MEGAN
CAPONETTO

PANEL OF EXPERTS

DRAWING FROM THE FIELDS OF DESIGN, TECHNOLOGY AND INVENTION, **POPULAR MECHANICS** AND **HISTORY** ASSEMBLED A PANEL OF EXPERTS WHO HELPED SELECT AND RANK THE 101 MOST SIGNIFICANT GADGETS.

BUZZ ALDRIN

Apollo 11 astronaut

GREG ALLGOOD

Director, Children's Safe Drinking Water at Procter & Gamble

PAOLA ANTONELLI

Curator of architecture and design, Museum of Modern Art, New York

BIANCA BOSKER

Technology editor, *Huffington Post*

GEORGE DAVISON

Founder and CEO of Davison International

JAMES DYSON

Inventor, Dyson Dual Cyclone vacuum

SHAWN FRAYNE

Inventor/president, Humdinger Wind Energy

LAUREN GOODE

Producer/reporter, *The Wall Street Journal* Digital

LONNIE JOHNSON

Inventor, Super Soaker

BRIAN LAM

Editorial director, *Gizmodo*

TIM LEATHERMAN

Inventor/founder, Leatherman Tool Group

JOHN MAEDA

President, Rhode Island School of Design

DAVID POGUE

Technology columnist, *The New York Times*

ELSPETH ROUNTREE

Digital strategist

WITOLD RYBCZYNSKI

Martin and Margy Meyerson professor of urbanism and professor of real estate, The Wharton School, University of Pennsylvania

TIM WU

Professor of law, Columbia University; author, *The Master Switch*

2. RADIO

Patented in 1896 as "wireless telegraphy" by Guglielmo Marconi – who based his work on technology developed by Nikola Tesla.

3. TELEVISION

Conceptualised in 1877 by Edison and Bell and patented by inventor Philo T Farnsworth in 1930, television spread rapidly after World War 2. Except in South Africa, that is, which got the goggle box only in 1975. Less than four decades later, SA was beaming the FIFA World Cup 2010 to billions worldwide.

4. HYPODERMIC SYRINGE

Invented in 1844, among other things it's spared millions from polio, TB and more via injected vaccines.

5

PERSONAL COMPUTER Altair's 8800 debuted in 1975 as a hobbyist kit. Two months later, Bill Gates released a programming language for the Altair, and by 1977 the Apple II revealed the PC's true potential: it shipped with the video game Breakout.



6. AIR CONDITIONER

See "Gizmo expos" (pg 33).

7. TELEPHONE

"As a practical man, I did not quite believe it; as a theoretical man, I saw a speaking telephone by which we could have the means of transmitting speech and reproducing it in distant places. But it really seemed too good to be true..." – Alexander Graham Bell, *POPULAR MECHANICS*, 1912



8. PHONOGRAPH see "Music Machines" (opposite).

9. ALARM CLOCK

Alarm clocks have been around for centuries, but clockmaker Seth Thomas's 1876 model, planted on the bedside table, helped drag the industrial revolution out of bed.

10. LIGHTBULB

see "Faceoff" (pg 32).

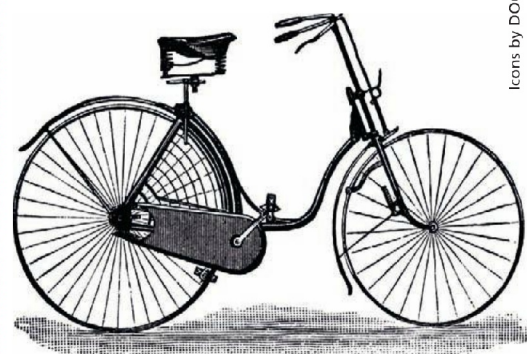
11. DRY CELL BATTERY

See **82 TORCH** (pg 38).



12. BICYCLE

Chain-driven safety bikes trumped big-wheel "ordinaries" and gave mobility to the masses – particularly bustle-wearing women.



Rover Safety Bicycle, circa 1885



MUSIC MACHINES

THIS GADGETRY TRACKS THE RISE AND FALL OF FORMATS – BOTH RECORDING AND PLAYBACK – AND THE SPREAD OF DIFFERENT GENRES

Apple sold 600 000 first-gen iPods in two years, despite some warts such as no PC compatibility.



■ 8. PHONOGRAPH

When Thomas Edison unveiled the first device to record and play back sound in 1877, he foresaw – brace yourself – automated messages delivered over phones. Luckily, Edison's embossed tin cans gave way to the wax cylinders and vinyl discs that spawned the recording industry.

TRANSISTOR RADIO Regency TR-1 of 1954 replaced valves with transistors. (16)

HI-FI The 1950s boom spawned gadget buffs masquerading as music purists. (25)

CASSETTE TAPE Birth of the bootleg. (50)

WALKMAN Music gets personal. (45)

BOOMBOX We take the party to the streets. (70)



CD PLAYER Having supplanted vinyl, overtook cassette in the 2000s. (30)

MP3 PLAYER Spending on music dropped drastically as digital downloads broke the record-company mould. (42)

■ 13. MATCH

The first non-poisonous match wasn't invented until 1910. Before that, a book of matches packed enough toxic white phosphorous to kill a person.



■ 14. QWERTY KEYBOARD

Christopher L Sholes studied letter-pair frequency and his resulting keyboard layout, introduced in the 1874 Remington Standard 2 typewriter, not only prevented type bars from crossing up, but lasted into the computer age.

■ 15. MODEM

In 1949, the first modems (MODulation/DEModulation) converted air force radar data into sounds and squawked them over phone lines.

■ 16. TRANSISTOR RADIO

See "Music machines" (above).

■ 17. HANDHELD GPS

After the US military system was opened up for civilian use in 1983, Magellan sold the first handheld unit in 1989.

■ 18. VACUUM CLEANER

Although early models were expensive, prices had dropped sufficiently by the mid-1950s to make upright vacuums a middle-class staple.

GADGETS
THAT
WILL CHANGE
THE
FUTURE

PERSONAL ROBOTS

The first mass-market home robots are not multifunction servants, but rather purpose-built autonomous machines. So, in future we'll be served by intelligent appliances, not the mechanical "people" we'd envisaged.

FACEOFF



10.



INCANDESCENT

LED (31)

131	AGE	49
Multiple (usually Thomas Edison)	INVENTOR	Multiple (usually Nick Holonyak of GE credited with the first practical visible-spectrum LED)
R9	AVERAGE COST PER BULB	R200 (est)
1 500 hours	LIFE HOURS	60 000 hours
14,5 lumens/watt	EFFICIENCY	65 lumens/watt
Original heavyweight now generates more heat than light	<< SPLIT >> DECISION	Low-watt upstart odds-on favourite as the future of lighting.

19.

BROWNIE CAMERA Inexpensive and easy to operate, the Brownie brought the snapshot to the masses.



■ **20. REMOTE CONTROL** see "Tube Toys" (opposite).

■ **21. ANSWERING MACHINE** Released in 1971, the Phone-Mate Model 400 was the first widely used example. It was a blessing and a curse: its tapes could capture 20 messages, enabling selective communication.

■ **22. VCR** See "Tube toys" (opposite).

■ **23. LAPTOP** A successful early laptop, the GRiD Compass 1101 – a clamshell computer of 1982 – weighed a whopping 5 kilograms.

■ **24. SEWING MACHINE** See "Gizmo expos", (opposite).

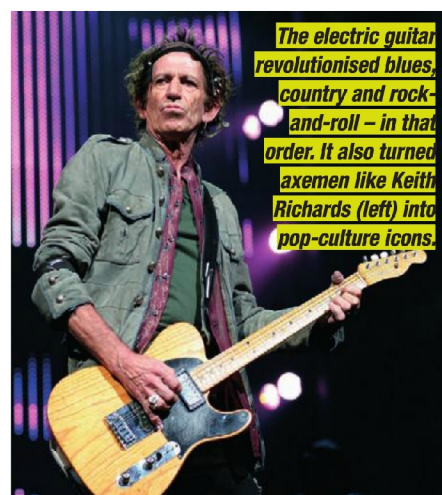


■ **25. HI-FI** See "Music machines" (pg 31).



■ **26. SHIFTING SPANNER** See "Man at Work" (pg 34).

■ **27. BLACKBERRY** "It will soon be possible to transmit wireless messages so simply that an individual can carry his own apparatus," inventor Nikola Tesla said in 1909. The BlackBerry arrived in 1999.



The electric guitar revolutionised blues, country and rock-and-roll – in that order. It also turned axemen like Keith Richards (left) into pop-culture icons.

■ **28. ELECTRIC GUITAR** Leo Fender designed the first mass-produced solid-body electric guitar, the Telecaster, in 1951.

■ **29. CAMCORDER** At its height, America's Funniest Home Videos was getting 2 000 tapes a day, testimony to the success of JVC'S 1984 creation.

■ **30. CD PLAYER** See "Music machines" (pg 31).



■ **31. LED** See "Faceoff" (above).



GADGETS THAT WILL CHANGE THE FUTURE

INDUCTIVE CHARGERS

Now available as accessories from companies such as Powermat and Energizer, plugless chargers will soon be integrated directly into devices, making power as wireless as data currently is. Future systems could run small appliances and even TVs.

■ **32. MOUSE** First paired with Apple's Lisa computer in 1983, it retains the same basic design.

■ **33. MICROWAVE** See "Cook-o-matic" (pg 37).



■ **34. DIGITAL CAMERA** Kodak retired Kodachrome film in 2009 after 74 years of service as this gadget, introduced in 1990, took off.

■ **35. MICROPHONE** A single word explains its role in bridging East and West: karaoke.



36.

■ **8 MM CAMERA** It's the most famous home movie in history: 486 frames that record on Kodachrome II safety film the assassination of US President John F Kennedy.

■ **37. WRISTWATCH** In 1901, while celebrating in Paris after winning a prize for circling the Eiffel Tower in a dirigible, Brazilian aviator Alberto Santos-Dumont asked his friend Louis Cartier to design a watch that would permit him to time aerial manoeuvres and still keep his hands on the controls. Three years later the Santos men's wristwatch, with leather strap and buckle, went on sale.

■ **38. HDTV** See "Tube toys" (above).



TUBE TOYS

WE SUBMIT: THE GADGETS THAT MAKE TELEVISION EASIER AND MORE FUN TO WATCH RIVAL THE INVENTION OF THE TV ITSELF

20. REMOTE CONTROL

Zenith's Lazy Bones, invented in the 1950s, use a wire; the first wireless remote, the Flash-matic, used a beam of light.

VCR Sony's first Betamax VCR in the mid-1970s started a court battle lasting in the 1980s about the legality of home taping. (22)



DVD PLAYER The first DVD movie release was Twister, a year after the first player came out in 1996. (77)

DIGITAL HDTV Since it arrived in shops in 1998, High-def has steadily gained ground: more than half of US households have HDTV. (38)

DIGITAL VIDEO RECORDER The DVR didn't kill the TV advertisement – it just made people watch even more TV. (91)



GIZMO EXPOS

COME ONE, COME ALL TO THE WORLD'S FAIR AND MARVEL AT THE OPTIMISTIC, FUTURISTIC TECH

24. SEWING MACHINE

Eighty years after the first mechanical stitcher cut the time it took to sew a shirt from 14 hours to 1, Singer unveiled a portable version (the 5 kg Featherweight).

DOMESTIC AIR CONDITIONER

In 1953, Americans alone bought more than a million window a/c units; over the past five years manufacturers shipped (gasp!) 41 million. (6)



ZIP The button's dominance began to slip in 1921, when B F Goodrich used a "separable fastener" in its Zipper boots. (65)



Power to the people: This early Black & Decker electric drill revolutionised the handyman's arsenal.



MAN AT WORK

THESE GADGETS TURNED HOMES INTO DIY CASTLES

■ **26. SHIFTING SPANNER** Invented in the 1800s, the shifter is still a go-to home repair tool.

ELECTRIC DRILL The workshop's most common power tool was introduced by Black & Decker in 1916, with a grip loosely based on the handle of the Colt .45. **(39)**

CIRCULAR SAW The quest to downsize and repurpose the spinning blades used in sawmills led to the 1923 invention of the worm-drive circular saw by Edmond Michel, whose company later became Skilsaw. **(49)**

LAWNMOWER The essential garden gadget was inspired by a factory tool: the carpet cutter. **(51)**

TAPE MEASURE **(66)**

CHAIN SAW Backyard warriors have been using solo saws to prune trees and cut firewood since the 1950s. **(76)**

LEAF BLOWER Petrol-powered models are noisy and air-polluting, but that hasn't stopped their proliferation: they do, after all, reduce garden-maintenance time. **(81)**



Lawnmower by Ryan McVay/Getty Images

■ **39. ELECTRIC DRILL** See "Man at work" (above).



■ **40. WI-FI ROUTER** Wi-Fi has made its way into more than 9 000 devices, from phones to TVs, since its introduction in 2000.

■ **41. POCKET CALCULATOR** The first all-transistor calculator was too heavy to fit into a shirt pocket: the IBM 608 weighed 2 tons. By 1976, four-function pocket calculators were cheap – and pocket-friendly.

42.

■ **MP3 PLAYER** See "Music machines" (pg 31).



■ **43. POLAROID CAMERA** In 1943, 3-year-old Jennifer Land asked her father

Edwin, "Why can't I see the pictures now?" Five years later, Land's company, Polaroid, began selling instant film and cameras.

■ **44. FLOPPY DISC** See "Saving the world" (opposite).

■ **45. SONY WALKMAN** See "Music machines" (pg 31).



■ **46. FIRE EXTINGUISHER** The first model (1723) sounds more dangerous than the fire: a cask that held liquid

GADGETS THAT WILL CHANGE THE FUTURE MOTION-CAPTURE DEVICES

The Microsoft Kinect Xbox peripheral is the first mass-market motion-capture device; its tech pioneered a new gestural computer interface. In the future interactions with computers will be conversational – and facial expressions may take the place of a mouse.



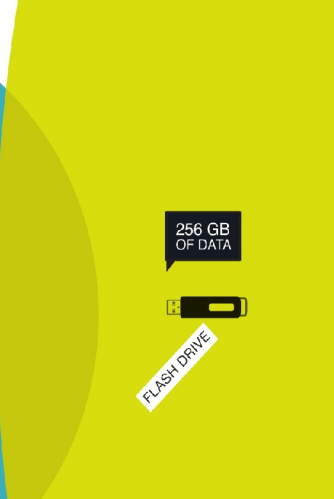
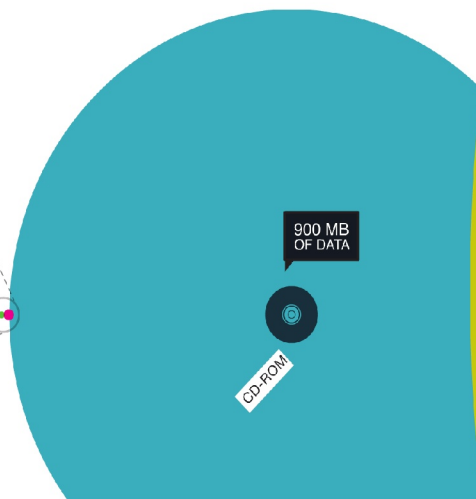
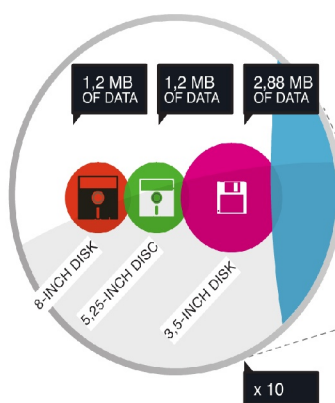
SAVING THE WORLD

WHEN IT COMES TO DIGITAL STORAGE, SIZE CUTS BOTH WAYS – EVER SMALLER DEVICES WITH EVER GREATER CAPACITY. HERE, 40 YEARS OF GROWTH (AND SHRINKAGE)

■ **44. FLOPPY DISC** Introduced by IBM in 1971, now-extinct floppies live on in the Save icon on drop-down menus.

CD-ROM killed the floppy with huge storage capacity. (59)

FLASH DRIVE In the early 1980s, Toshiba engineer Fujio Masuoka developed flash memory, so named because the erasure process reminded a colleague of a camera flash. The first USB memory stick arrived in 2000 with all of 8 megabytes of storage. (88)



and a pewter gunpowder chamber connected to fuses. At the first flicker of flame the occupant lit the fuses to ignite the gunpowder, which scattered the retardant. We've moved on since then.

■ **47. MULTITOO** See "Faceoff" (pg 36).

■ **48. GAME BOY** Among the most successful gaming systems ever, with 118 million units and half a million games sold.

■ **49. CIRCULAR SAW** See "Man at work" (opposite).



■ **50. CASSETTE TAPE** See "Music machines" (pg 31).



■ **51. LAWNMOWER** See "Man at work" (opposite).



■ **52. KINDLE E-READER** "I'm not a gadget freak, but I have fallen in love with this thing." – Oprah Winfrey

■ **53. CAR JACK** Richard Dudgeon devised his first hydraulic jack in 1850 for, would you believe it, shipyards and railway repair yards.

■ **54. BALLPOINT PEN** Hungarian newspaper editor László Bíró took out a patent on the first practical ballpoint in 1938.

■ **55. CB RADIO** The CB craze of the 1970s was epitomised by *Smokey and the Bandit*, but like hula hoops, it's now restricted to a tiny minority.

■ **56. TAPE RECORDER** In 1935, AEG came up with a tape-based improve-

ment on existing wire recorders. It wasn't until the next century that digital tech overtook tape in everyday use.

■ **57. HAIR DRYER** These personal-care staples were created by engineers engaged in building blender motors.

■ **58. OUTBOARD MOTOR** Ole Evinrude's outboard motor was patented in 1911, but it wasn't until post-World War 2 that powerboating became the choice weekend recreation of the upwardly mobile.

■ **59. CD-ROM** See "Saving the world" (above).



■ **60. MOOG SYNTHESISER** Among the first widely used electronic instruments, the Moog had analogue

FACEOFF

47.

CAN US INGENUITY
TRIUMPH OVER THE CLASSIC
SWISS MULTITOOL?**LEATHERMAN (47)**

Tim Leatherman, engineer

THE MOTIVATION

Frustration. A European vacation and the inadequacy of a mere pocketknife to turn a stripped radiator handle.

THE START

The Pocket Survival Tool, introduced in 1983, had 14 tools, including pliers, four screwdrivers, a can opener, an awl and a blade.

THE STATS

The Surge has 21 tools and two drill bits.

THE WINNER >>

A hard-charging contender for the top spot.

SWISS ARMY KNIFE (79)

Karl Elsener, cutler

THE MOTIVATION

Nationalism. Elsener was upset that Swiss soldiers carried German-made knives.

THE START

The Soldatenmesser, introduced in 1891, had four tools: a blade, an awl, a can opener and a screwdriver.

THE STATS

The SwissChamp has 35 tools, including a chisel.


THE WINNER >>

A timeless tool that has the edge for now.

circuits to generate sound electronically. Without it, the Doors' *Strange Days*, Simon and Garfunkel's *Bookends* and the Beatles' *Abbey Road* would have sounded very different.

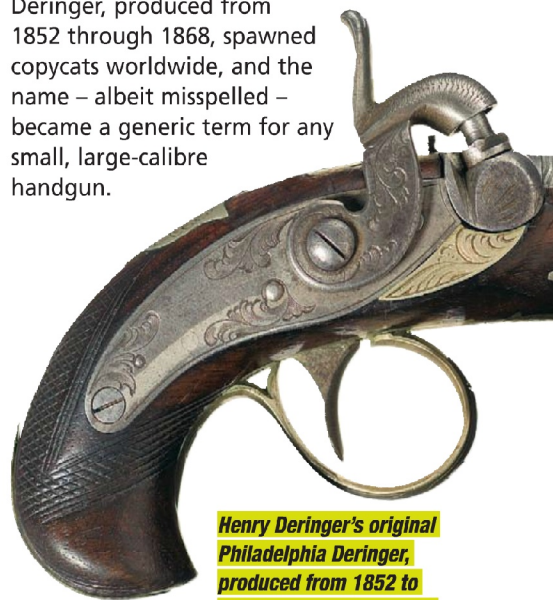
61. SMOKE DETECTOR Duane Pearsall wanted to curb static in photo darkrooms but noticed that a meter measuring ion concentration on his static-control device flatlined whenever cigarette smoke hit it. By accident, he had discovered how to make an ionisation smoke detector.

62. CHARCOAL GRILL

There's a good reason it looks like a  buoy. Chicago metal-shop owner George Stephen borrowed the same shape – and material – used in a harbour guide when he built the first Weber kettle in 1951.

63. LUNCHBOX When Aladdin Industries launched the Hopalong Cassidy kit in 1950, it kicked off the lunchbox boom: between 1950 and 1970, 120 million lunchboxes shot off US shelves as the youth scrambled to get the latest in branded boxes.

64. DERRINGER The derringer used to assassinate US president Abraham Lincoln was actually a deringer with one r. Renowned pistol-maker Henry Deringer's original Philadelphia Deringer, produced from 1852 through 1868, spawned copycats worldwide, and the name – albeit misspelled – became a generic term for any small, large-calibre handgun.



Henry Deringer's original Philadelphia Deringer, produced from 1852 to 1868, spawned copycats worldwide.

GADGETS THAT WILL
CHANGE THE FUTUREMOBILE
HOTSPOTS

Receivers such as the Novata MiFi hotspot, which takes long-range cellular signals and turns them into short-range Wi-Fi networks may, in future, allow high-speed Internet access to reach areas where broadband infrastructure cannot.

■ **65. ZIPPER** See "Gizmo expos" (pg 33).



■ **66. TAPE MEASURE** See "Man at work" (pg 34).



■ **67. BINOCULARS** After Pearl Harbour, the Universal Film Company reconfigured its film manufacturing lines to mass-produce binoculars for use in fields where birders dared not tread.



■ **68. COLEMAN LANTERN** WC Coleman marketed his Quick-Lite to farmers in 1916, but as electrification spread to rural areas, he rebranded the device as an outdoorsman's essential.



■ **69. ELECTRIC TOOTHBRUSH** US Navy submarines didn't have too much to smile about: subsisting on mushy canned food for months on end, they got almost zero gum stimulation. Electric toothbrushes came aboard 1959, solving the problem. They later found a wider audience – and inspired the invention of another vibrating device (but that's a gadget for an entirely different article).

■ **70. BOOMBOX** See "Music machines" (pg 31).



GADGETS THAT WILL CHANGE THE FUTURE WIRELESS HEALTH MONITORS

Healthcare communications products such as the Bosch Health Buddy have the potential to help tame out-of-control healthcare costs by reducing expensive doctor's-office visits and enabling remote diagnostics.



COOK-O-MATIC

1950S KITCHENS WERE TESTBEDS FOR INNOVATION

■ **78. CAN OPENER** GE rolled out the automatic electric can opener in 1958.

TOASTER The pop-up toaster came of age in the '50s, using heat sensors, not timers, to deliver perfectly browned bread. (83)

BLENDER In a 1949 TV commercial, blenders became more than drink mixers: the Vita-Mix created a meal from peanuts, carrots, apples and eggs – shells included. (94)

TEFLON PAN DuPont says the coating it debuted in 1961 has "the world's most slippery substance"; 50 years' worth of eggs agree. (89)

MICROWAVE the first countertop microwave hit shops in 1967 – and stayed there. But radiation fears couldn't beat the reheat: by 1975, microwaves outsold conventional stoves. (33)

DRIP COFFEE MAKER Mr Coffee brought filter coffee into the US home in 1972, rendering the percolator obsolete. (84)





Pre-PowerPoint-era bosses relied on the Kodak Carousel for visual communication. Here, Don Draper pitches the ad campaign for the gadget on *Mad Men*.

■ **71. KODAK CAROUSEL** Adman Don Draper said it best in his pitch to Kodak execs in an episode of the '60s-set show *Mad Men*: "This device isn't a spaceship, it's a time machine." He waxed poetic about the Carousel, the ingenious 35-mm side projector, while clicking through images of his family life before it unravelled. "It lets us travel the way a child travels – around and around and back home again."

■ **72. STOPWATCH** When the TAG Heuer Mikrograph stopwatch was invented in 1916, it allowed the measurement of time with unprecedented accuracy – down to 1/100 of a second. This precision led to significant changes in the sports world, including records such as the world's first sub-4-minute mile (3:59.4 by Roger Bannister on 6 May, 1954). Digital stopwatches, accurate to 1/1000 of a second, debuted in 1971.

■ **73. PRINTER** Hewlett-Packard's Laserjet cost about R20 000 when it came out in 1984. Today, lasers are cheap, but their ammo isn't: a toner cartridge for a R750 laserjet costs R500.

■ **74. SAFETY RAZOR** Stay with us now: "Every razor sold represents a saving of half an hour spent in a barbershop... with an approximate number of 10 million customers, this would represent a saving of 5 million hours... (or) 500 000 days of the labour of 500 000 men. (At) \$3 per day (this) represents a saving of \$1,5 million per day, or for a year of 300 days, \$450 million." – King Camp Gillette, inventor, Gillette Safety Razor, 1918

■ 75. ELECTRIC BLANKET

Breakfast-cereal inventor and sanatorium director John Kellogg advocated sleeping outdoors to promote general wellness. His "thermo-electric" blanket enabled residents to enjoy fresh air regardless of the season.

■ 76. CHAIN SAW

See "Man at work" (pg 34).



■ 77. DVD PLAYER

See "Tube toys" (pg 33).



■ 78. CAN OPENER

See "Cook-O-Matic" (pg 37).

■ 79. SWISS ARMY KNIFE

See "Faceoff" (pg 36).



■ 80. SPINCAST FISHING REEL

In 1949, the Zero Hour Bomb Company faced extinction, with its patent on an oilfield time bomb running out. Plans for an easy-to-use enclosed-spool fishing reel prompted a company name change to Zebco – and the rest is history.



■ 81. LEAF BLOWER

See "Man at work" (pg 34).



■ **82. TORCH** The invention of the dry cell battery (11) in 1886 paved the way for the torch, released in 1898. Early versions earned the moniker "flashlight" for their inability to provide a steady beam.

■ 83. TOASTER

See "Cook-o-matic" (pg 37).



■ 84. DRIP COFFEE MAKER

See "Cook-o-matic" (pg 37).



85.



■ **SUNGLASSES** Regardless of which Ray-Ban Aviator icon you pick – General Douglas MacArthur during World War 2 or Tom Cruise in *Top Gun* – it all started in 1929 on the boardwalk in Atlantic City, New Jersey, where Sam Foster hawked America's first mass-produced plastic sunglasses to beachgoers.

■ **86. HEARING AID** According to the USA's National Institutes of Health, only one out of five people who could benefit from a hearing aid actually wears one.

■ **87. GINSU KNIFE** For better or worse, the ads for these blades ushered in the era of the infomercial tout: "But wait – there's more."

■ **88. FLASH DRIVE** See "Saving the world" (pg 35).

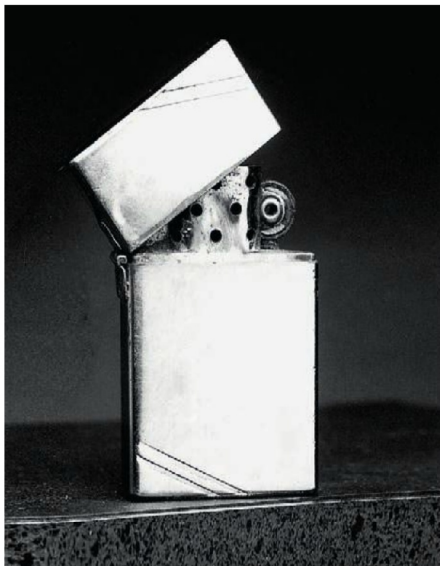


GADGETS THAT WILL CHANGE THE FUTURE

TABLETS

Apple's iPad is already a commercial success, but we are only beginning to see the effects of its influence. Tablets represent a new lean-back computing platform that is changing the design of everything from games to fine literature – yes, *PopMech* has a tablet edition!

■ **89. TEFLON PAN** See "Cook-o-matic" (pg 37).



■ **90. ZIPPO** The Zippo moment – when a concert audience raises its lighters in the air – has been rocking the power ballad since the '60s. In 2008, the company introduced an iPhone app for that: the digital Zippo operates just like the real thing, opening with a flick of the wrist, lighting with a swipe of the flint wheel and mimicking real flame movement as the user waves his phone in the air.

■ **91. DVR** See "Tube toys" (pg 33).



■ **92. PICNIC COOLER**

That tub you use to chill beer was patented in 1951 as a "Portable ice chest for storing foods and the like".



■ **93. BRA** "I can't say the brassiere will ever take as great a place in history as the steamboat, but I did invent it." – Mary Phelps Jacobs, who in 1914 used handkerchiefs, ribbon and cord to create an early vision of the bra.

■ **94. BLENDER** See "Cook-o-matic" (pg 37).



■ **95. SUPER SOAKER** Since 1990, no fewer than two dozen Super Soaker models have wrought backyard mayhem, but none is more coveted than the CPS

2000 Mk1. The most powerful water gun ever manufactured, it shoots nearly a litre of water per second up to 15 metres. The Mk1 was discontinued soon after its release, but it's available on eBay for a cool R2 000.

■ **96. QUICK-RELEASE SKI BINDINGS**

Champion skier Hjalmar Hvam invented the Saf-ski system while recuperating from an accident aggravated by fixed ski bindings. Local relevance: the ubiquitous clip-in pedals used by cyclists were pioneered by Look, who drew on their own experience in clip-in ski bindings.



■ **97. AEROSOL SPRAY CAN**

In 1941, Lyle Goodhue and William Sullivan used the newly discovered refrigerant Freon to enable the deployment of a lethal (to bugs, anyway) mist by troops fighting on insect-infested fronts. The "bug bomb" cocktail, held in a 500 ml steel canister, consisted of Freon-12, sesame oil and pyrethrum (the last is a natural insecticide derived from chrysanthemum blooms).

■ **98. ROOMBA** Before it unveiled the Roomba Floorvac for the home market in 2002, iRobot built landmine-clearing robots, which used the so-called circle circle algorithm. The same tech was adapted to enable the Roomba to circle and sweep autonomously. The device is far and away the best-selling mobile robot.

■ **99. STAPLER** Said to date back to the 17th-century French court, the stapler as we know it was patented in the 1800s.

■ **100. GLASS FIBRE**

FISHING ROD When hostilities in Asia curtailed bamboo imports, rod-makers needed a new material to keep



anglers equipped with low-cost, quality tackle in the 1950s and 1960s; enter glass fibre.

■ **101. DUCT TAPE**

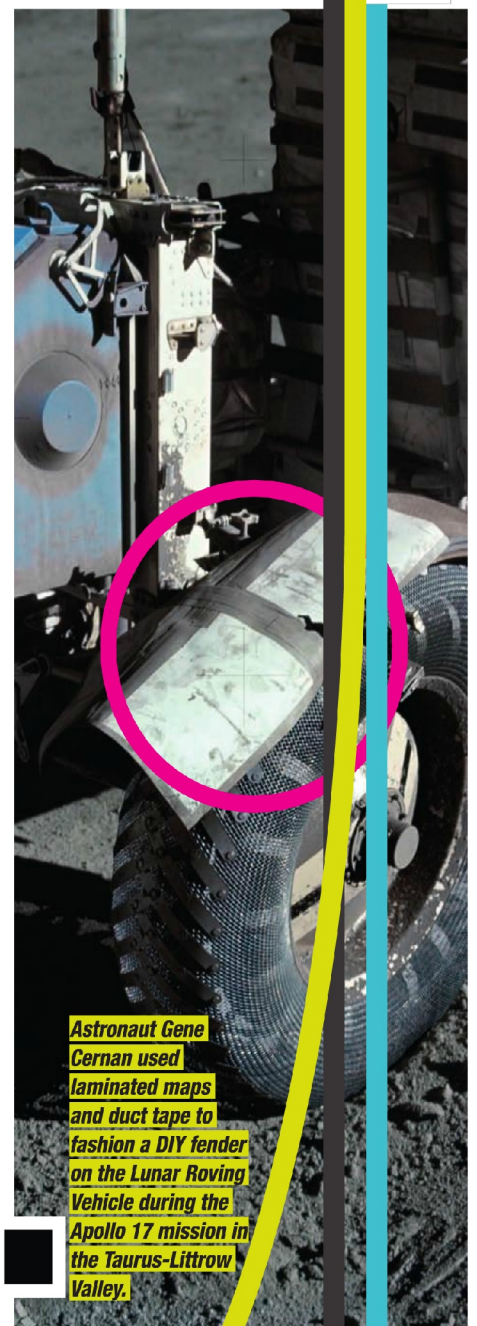
Astronauts have used it to make repairs on the Moon and in space. The Myth-Busters built a boat with the stuff. And enthusiasts have used it to make party dresses and wallets. You might say it's a material, not a gadget, but trust us: duct tape is the ultimate multitool.

PM

71 - 101

GADGETS 101

101



Astronaut Gene Cernan used laminated maps and duct tape to fashion a DIY fender on the Lunar Roving Vehicle during the Apollo 17 mission in the Taurus-Littrow Valley.

LESSONS FROM JAPAN

AN EPIC EARTHQUAKE
AND TSUNAMI LEAVE
HARD-WON KNOWLEDGE
IN THEIR AFTERMATH.

BY CARL HOFFMAN



IMAGES

> Visit www.popularmechanics.co.za/facebook to view images of the aftermath of Japan's Earthquake taken by Nasa.



11 March, 2011
Magnitude 9,0
earthquake



A well-paved two-lane road along Japan's northeast

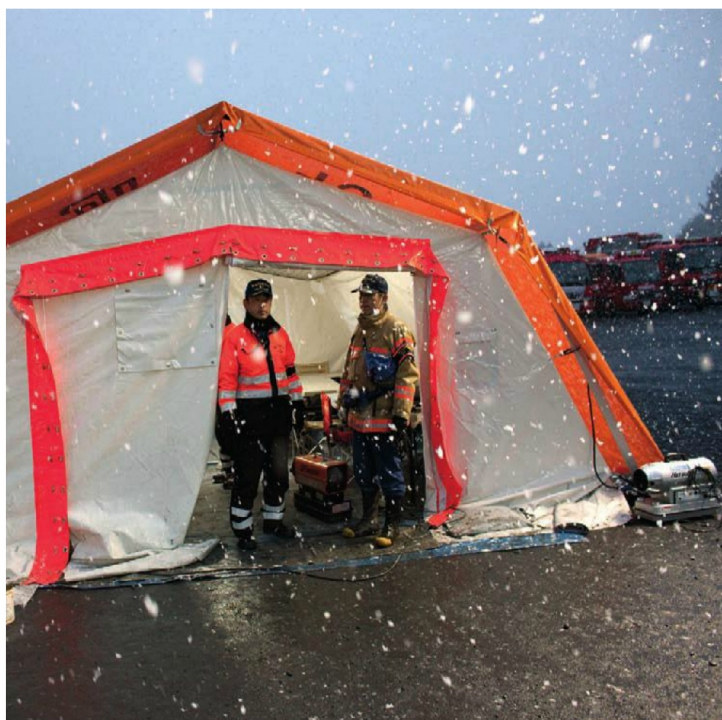
coast winds through the mountains, gradually descending toward Rikuzentakata. The seaside city, population 23 000, once attracted tourists and elderly Japanese with its gorgeous views and idyllic beaches. A river plunges down short, steep slopes through the town and into the sea.

At the end of March, a week after a magnitude 9,0 earthquake rocked the region, the trees along the road are ready for the first bud of spring. A banal landscape of suburbia passes: homes with children's bicycles on porches. The parking lot of a 7-Eleven is filled with cars, but its filling station has no fuel.

And then the road descends into downtown Rikuzentakata – and a world crushed. A sickly brown-grey carpet of rubble stretches to the horizon, dotted with bright-red front-end loaders and firetrucks. A few random concrete buildings are still standing, shattered windows gaping, facades strewn with tree limbs and fishing nets. Cadres of responders wearing helmets and face masks advance in slow-moving lines, probing the debris field with long poles. They are looking for the dead.

The mechanics of the disaster are well-known to the world: a massive earthquake, 130 kilometres offshore, produced the tsunami that struck this and other coastal cities. Seeing it

Firefighters from the inland City of Saitama were the first emergency workers to reach Rikuzentakata. The normally 6-hour drive took 18. The lesson: during a disaster, the public must be ready to care for themselves.



firsthand is overwhelming. Rikuzentakata has been reduced to 1 000 hectares of broken wood and twisted steel beams. Evidence of ruined lives is everywhere. Flattened trucks, flipped upside down. A man's tie in a tree. Photo albums in the mud. A bowl. A sodden teddy bear.

Takehiro Shimamura, a firefighter from the inland city of Saitama, was among the first emergency personnel to enter the city. "People in the high places were crying, in shock with their mouths hanging," he says. "Along the river we found no one alive, not a person."

Experts consider Japan's disaster planning and infrastructure the best in the world. This assessment proved correct when it came to preventing death and damage from the earthquake, the fourth largest ever recorded. The resultant tsunami, however, killed more than 25 000 people, despite the extensive protection built along the east coast.

The destruction taught the world that preparedness is as much a matter of education as of infrastructure. The tsunami was pitiless. For those who knew what to do, survival was possible, but those who hesitated died. "The ones who survived in Japan are the ones who went to higher ground, period," says Patrick Corcoran, a hazards outreach specialist at Oregon State University. "Do you know where the higher ground is right now?"

ON THE AFTERNOON OF 11 MARCH, Masako Tanaka was in Kesennuma, a coastal city 20 kilometres south of Rikuzentakata. The 57-year-old was making one of her periodic visits to her native Japan from her home in Los Angeles.

Tanaka and her 70-year-old aunt were near Kesennuma's port when the ground started rumbling. The tremors lasted 6 minutes. "The road was moving like a wave," she says. "We did not even know if the tsunami was coming right away or not, but somehow I felt that this earthquake was like nothing I had ever experienced in my life."

During the quake, Japan's skyscrapers swayed like bamboo trees in the wind, but did not fall. "The biggest takeaway", says Bozidar Stojadinovic, professor of civil and environmental engineering at University of California, Berkeley, "is that modern building codes worked."

Japan's codes are strict, but developers often go further than regulations demand, fitting buildings with devices that act like giant shock absorbers. "Developers are

eager to deploy technology because Japanese will pay more money to live in a building with seismic isolators," Stojadinovic says.

On the other side of the Pacific, where one of the world's other notable earthquake zones is situated, the focus on preparation is more lax. In the USA's quake-prone Pacific Northwest, the onus of protection falls on property owners. Local governments often encourage safeguards, but do not mandate them. For example, Seattle offers classes on bolting wood-frame homes to foundations and securing water heaters, safeguards required by most insurance companies before they will issue earthquake protection.

Experts say that residents don't acknowledge the risk, and the area is not as prepared as Japan. "Many structures in the Pacific Northwest are not built to earthquake-resistant standards," says University of California, Irvine, public health expert Lisa Grant Ludwig. "There's a lot of brick, and it's a challenging problem."

Public infrastructure is another matter. Portland, Oregon, recently installed lateral support walls in and reinforced the brick exteriors of its schools; this year (as PM went to press), voters weighed in on a roughly R4 billion bond that would rebuild nine schools to national seismic safety standards.

These actions are prompted by a grim

READY FOR THE WORST?

Japan and the US have different approaches to infrastructure that can mean life or death during a natural disaster.

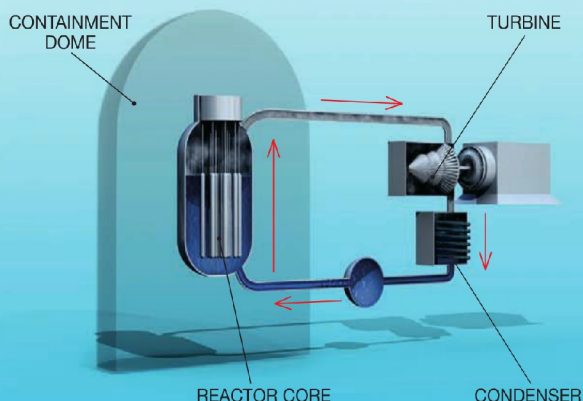
JAPAN

NUCLEAR POWER

1 Japanese plants typically have multiple reactors. Having more reactors in one facility means more hazardous fuel stored on-site and greater risks in the event of a plant-wide incident.

2 Japanese plants can't safely vent hydrogen. Uncooled fuel rods in a damaged reactor produce hydrogen, but many plants have no way to release the gas outside the reactor buildings before it reaches explosive levels, as happened in March.

3 Half of the nation's nuclear plants have boiling-water reactors. BWRs use the same water to cool the core as to turn the steam turbines, allowing radioactive leaks in the water to travel through the plant.



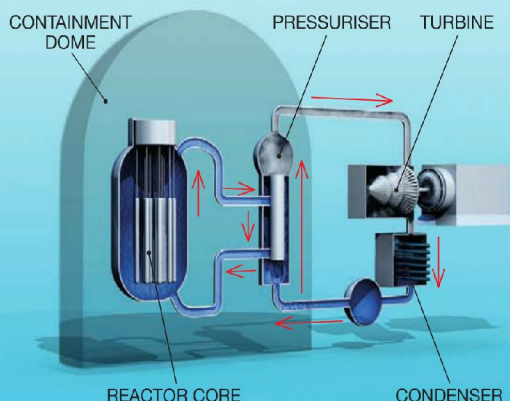
Diagrams by Raz

UNITED STATES

1 American power plants have fewer nuclear reactors, making a plant-wide incident easier to manage. No existing facility in the US has more than three reactors, although one in Georgia will soon have four.

2 US plants can vent hydrogen into the atmosphere. US reactors have stacks that release the gas outside the building, reducing concentrations below explosive levels, says Ken Brockman, former director of safety for the International Atomic Energy Agency.

3 Of the 104 reactors in the US, only 35 are BWRs. Most are pressurised water reactors that have two separate loops of water, one to create steam and another to cool the reactor. This removes a potential path for radiation to spread.



TRAINS

Seismometers relay messages to transformers to command trains to stop during a quake. L-shaped guides mounted on cars can safely halt derailed wheels.

Most trains and tracks outside California aren't equipped with automatic-shutdown quake sensors, but many trains can detect broken rails and stop.

EARLY-WARNING SYSTEMS

Thousands of sensors detect a quake's primary waves (P-waves), which travel at the speed of sound but cause little damage. The dangerous surface waves (S-waves) arrive later.

The nation's Advanced National Seismic System, a network of P-wave and S-wave detectors, is only 25 per cent complete. California's warning system could be completed in five years.

reality: an earthquake in the Pacific Northwest is not only expected, it's likely. The subduction fault running from Northern California to Vancouver Island moves an average of once every 150 years. The most recent large quake occurred in January 1700 – making the region 161 years overdue.

THE TSUNAMI THAT DESTROYED

Rikuzentakata and Kesennuma began when the earthquake pushed a 300-kilometre-long, 145-kilometre-wide section of seafloor up about 40 metres. The water displaced by this rupture raced east, its energy dissipating into the Pacific, and west toward the northeast coast of Japan.

Japan's early warning network blared

across public address systems and flashed on the screens of computers and mobile electronics.

When the tsunami hit the continental shelf, the wave slowed but grew in height. The surge topped seawalls, some 12 metres high. Kesennuma, like almost every town along the coast, was quickly inundated.

Masako Tanaka learned at a young age to head to high ground after feeling an earthquake. Her home in the coastal city where she grew up, near Kesennuma, was flooded by a tsunami in 1960. But in an

unfamiliar town, she wasn't sure where to go.

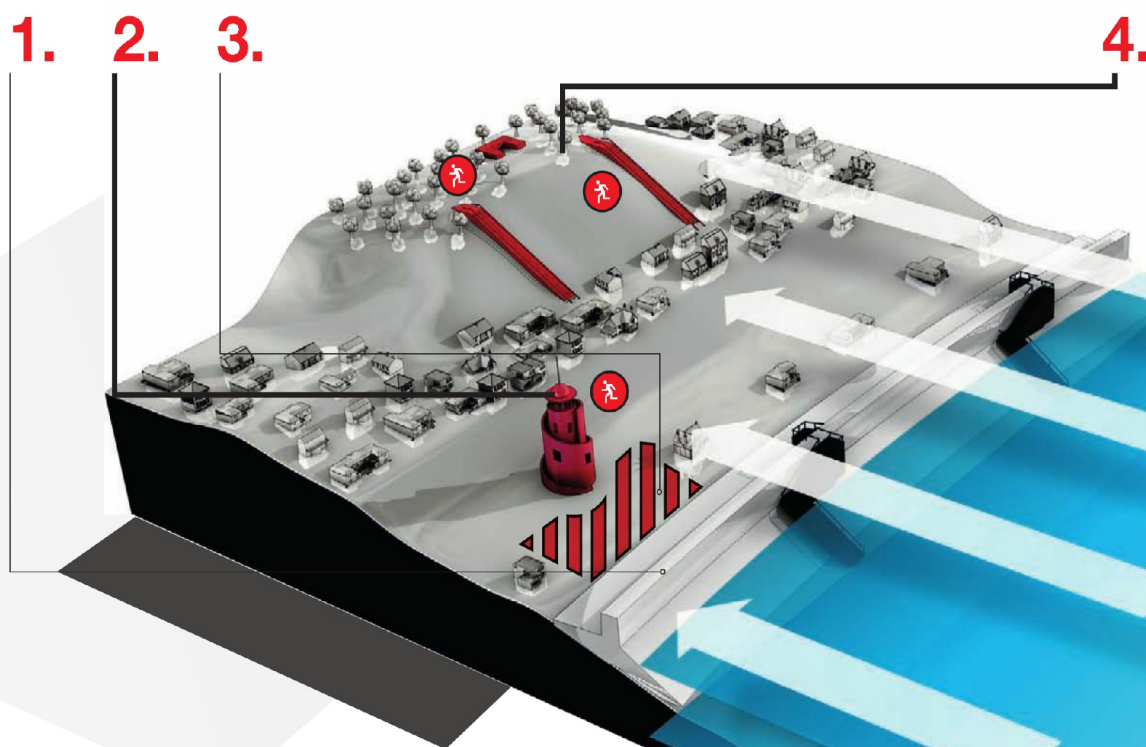
"We were patiently driving downtown, but there were so many cars, we could only go inch by inch," she says. "Then the alert system was warning us to get out of the car and evacuate to the hills. But people do not think to listen. They just kept going in their cars."

Abandoning their car, they saw a Japanese Coast Guardsman dashing back to his post at the port. Tanaka had just asked him for directions when he saw a video on his cellphone screen. On it was a live feed of the port's entrance, already frothing with the tsunami surge.

Tanaka and her aunt followed the

THE DEFENDED COASTLINE

When it comes to thwarting tsunamis, layers of protection are best.



1. RAISE WALLS

When a wave breaches a seawall – a high-profile and expensive defence – many call this a total failure. “Obviously, the smaller the wave, the better,” says researcher Mary Beth Oshnack. “But even if the seawall is shorter than the wave, it would still reduce the force of the wave.” The biggest problem with seawalls is that they tend to breed complacency. No wall can be expected to defeat every tsunami, and plans must be made for more layers of preparedness onshore.

2. CONSTRUCT TOWERS

Damage-resistant shelters can be constructed on high ground, providing a beacon for those fleeing an incoming wave. One such 73 m² shelter, in Nishiki, Japan, doubles as a disaster archive. Other Japanese emergency facilities flooded during March’s disaster – a grim reminder to model a wave’s potential path before construction.

3. DON'T BUNCH UP

“There is a saying that ‘disaster happens when people forget,’” says Futoshi Toba, mayor of Rikuzentakata. “Maybe we can make new concrete homes in higher places.” Japan’s coastline is crowded: very little of the nation is suitable for residential housing. In countries with more space, local authorities can zone larger plots to diminish the number of people living in danger areas. Zoning large plots would also decrease the amount of damaging debris pushed inland by a tsunami.

4. BUILD HIGH GROUND

Engineering well-marked, easy-to-access hills in tsunami-prone areas gives residents a familiar place to shelter and eases escape-route crowding. Hydrodynamists can simulate a tsunami’s potential reach, aiding the engineering and placement of such safe areas. As a bonus, these refuges can double as public parks.

guardsman to a nearby apartment building. Water gushed into the stairwell as the trio raced up two flights of stairs. The water flooded the stairwell by the time they reached the top; Tanaka’s aunt and the guardsman pulled her up to the roof from chest-high water. From there, the trio made a short leap to a neighbouring four-storey concrete building.

The survivors watched from the roof as water surged through the town. “I could tell that all of the people in cars were swept away by the time we were on the roof,” Tanaka says. The incalculable tide overwhelmed wooden structures. Houses that didn’t instantly disintegrate floated off their foundations. Concrete structures

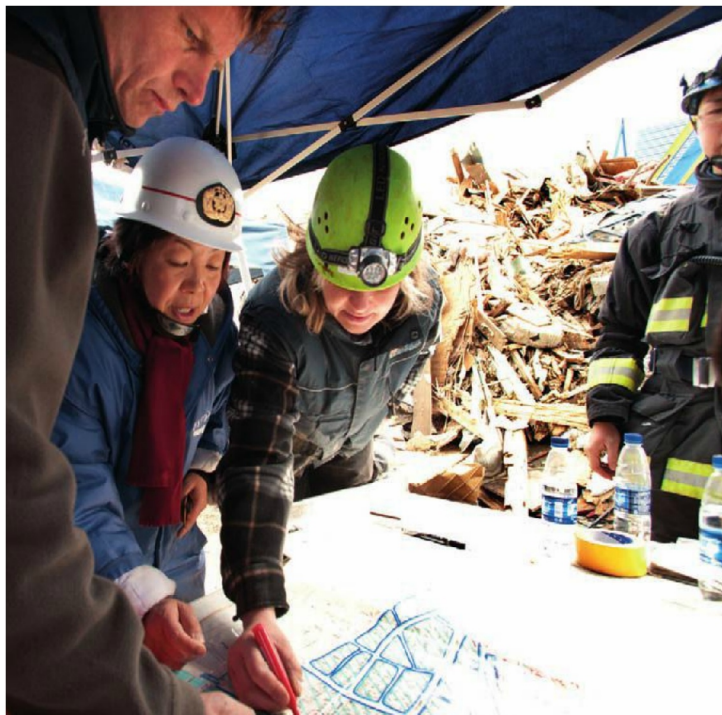
fared better, but the water washed over the roofs of three-storey buildings. Ships, cars and bits of building wreckage ground against one another in the filthy water, which consumed and absorbed anything in its path.

Japan is obsessed with tsunamis. High-water marks in Japan warn travellers how high previous tsunamis reached. And the government built a network of seawalls, costing billions, to protect the coasts. Yet a tsunami caused March’s staggering death toll. What happened?

“Japan never expected one this big,” says Harry Yeh, an Oregon State University tsunami expert. The odds were in favour of the seawalls – there have been only seven quakes with a magnitude of 8.8 or higher in the 20th century.

But seawalls cannot be dismissed as folly just because an abnormal event defeats them. In fact, researchers have found that small seawalls blunt the momentum of a tsunami even when overwhelmed. “In one of the lab trials, the seawall was physically ripped out of the ground, and the force was still reduced,” says Mary Beth Oshnack, who studied the issue at Oregon State. “When you look at pictures from (post-2004-tsunami) Thailand, the walls are

Masako Tanaka barely survived the 2011 tsunami – the second such close call of her life. Instead of returning home to Los Angeles, she stayed in her native Japan to serve as a guide and translator for rescuers.



really damaged, but the buildings behind them have moderate damage."

The idea of building giant seawalls to guard the US coast has been gaining traction. Texas governor Rick Perry supports them; last year the state formed a coalition of county judges to review a plan to extend a 15-metre R25 billion wall across Galveston Bay. Seattle is committing funds to a R2 billion seawall to replace one built in 1934. With hurricanes and tsunamis threatening national industries and large populations, these ideas seem expensive but prudent. But some experts worry that massive seawalls breed complacency and sap the will to be prepared.

"Projects worth trillions of dollars, with sophisticated infrastructure, are more attractive to policymakers than invisible options such as... strengthening community awareness," says Jonatan Lassa, who studies disaster risk mitigation at Harvard Kennedy School. "Engineering measures can reduce regular risks, such as cyclones and floods, but may not always protect people from the extremes." Rikuzentakata's seawalls stood 6 metres high; the tsunami was twice that. Only education can prepare people for the worst.

"Tsunami preparation is about cultural behaviour," Corcoran says. "Give me (R10 billion) and I'll personally talk to every

person along the Oregon coast, and they'll know where to go to higher ground."

ANY SERIOUS DISCUSSIONS about disaster preparedness must balance the cost of protection against the chance of a catastrophe happening. "How much insurance do you want to buy?" Berkeley's Stojadinovic says.

The answer depends on the level of risk. Geologists detect about 40 small quakes each year in the northeastern US, but the region's buildings have little seismic protection. That's because the likely frequency of a 7.0 quake hitting the eastern US is about one every 500 years. Society has decided to accept the long odds and not spend the money to guard against this low-probability event. But that choice may come with a price: a modest earthquake in the Northeast could cause more damage than a huge one in better-prepared California.

No matter where you live, Tanaka's experience may offer the best, most cost-effective lesson: Be prepared. "The single

greatest thing people can do is to understand that they will have to take care of themselves," says Mike Martinet, until recently the executive director of the Office of Disaster Management for 14 cities in the South Bay region of Los Angeles County.

"There are about 3 000 paramedics in greater Los Angeles, a city of 10 million people," Martinet says. "There just isn't enough government to take care of that many people, especially when roads and communications stop working."

The night of the tsunami, Tanaka distributed caramel sea salt brownies from her purse to fellow survivors. They endured snow in a shelter made from a sheet thrown to her by survivors atop a nearby hospital.

Nine days later, Tanaka was no longer a victim. Instead of heading back to Los Angeles, she was serving as a translator and guide for a team of Dutch volunteers and their cadaver dogs, searching the wreckage of her hometown for bodies. "I had to do something for my community," she says. "I just had an urge that I had to help them out."

Tanaka and her aunt are alive because she remembered what to do without panicking and acted quickly. Because of that, she's now able to help others. **PM**

TABLET WARS, ROUND 2:

Decisions, decisions. Having just committed our hard-earned cash to a spanking-new tablet, we hear of yet another, apparently better model offering amazing functionality, an improved operating system, better storage and all manner of cool apps. Before we lose the plot, let's take a step back and consider a recent letter from a PM reader on the subject of early adoption: his radical suggestion (for our readers, anyway) was that it might occasionally be a good idea to hold off until all the technical teething problems have been resolved.

Does this mean you should postpone buying a tablet? Nope. Obey your genes and go for it. To help speed you along your way, here are 10 of the hottest contenders: some are already here, others are on the way...

Archos 80 G9 and 101 G9

Looking for a tablet with great computing power and *serious* memory capacity? Then check out the 8-inch Archos 80 G9 and 10-inch Archos 101 G9, both powered by Android 3.1 Honeycomb: would you believe a 250 GB hard drive? They come with Google's full suite of mobile applications as well as Android Market, giving you access to over 200 000 apps, and they're loaded with a 1,5 GHz dual-core OMAP 4 processor from Texas Instruments.

The tablets are able to decode 1080p H264 High Profile videos, automatically organising them by title, actor, director, year, season and episode, providing a new way to experience HD entertainment.

Samsung Galaxy Tab 10.1

Remember the 7-inch Galaxy Tab? Well, it's just been joined by a bigger sibling. The Wi-Fi-enabled 10,1-inch tablet is just 8,6 mm thick, making it the slimmest in the world. What's good is that the scaled-down case doesn't compromise battery life: you get up to 9 hours of work between charges.

Powered by Android 3.1 (Honeycomb), Samsung's latest tablet offers faster and smoother transitions between different applications, more intuitive navigation to and from home screens, and broader support of USB accessories, external keyboards, joysticks and gamepads. It's powered by the nVidia Tegra 1 GHz dual core application processor, which delivers powerful gaming and multimedia performance.

A new version of Media Hub includes an HD Extender, which allows you to play back content on TV through an HDMI cable from a dock or adaptor. Other features include a 3-megapixel rear camera and a 2-megapixel front camera.

HTC Flyer

This 7-inch tablet features a single-core 1,5 GHz processor, a 5 MP rear-facing camera with autofocus, a 1,3 MP front camera for video chatting, a useful 16 GB eMMC memory plus microSD card slot, digital ink technology, and other goodies – all packed into an attractive case.

Interestingly, HTC has opted for Android 2.3.3 (Gingerbread) rather than Android 3.0 (Honeycomb); the latter is reportedly on the way. The display offers multi-touch capability, and a digital pen enables you to take synchronised notes and annotate content. The Flyer also offers Flash 10.2 support, by the way, and its battery life is excellent. We've tried it, we like it.



Apple iPad 2

First of all, there's not much wrong with the original iPad, so if you already own one, don't get all hot and bothered because your best friend has an iPad 2. Okay, so it's lighter and thinner than its predecessor, with a better (A5 dual-core) processor, a front-facing VGA camera for FaceTime and Photo Booth, and a rear-facing camera that captures 720p HD video... but that's about it. The price of this must-have product remains very competitive, and the rapidly growing app library should keep you happy for years to come (yeah, we *know* a year is a long time in the consumer tech world, but still). Against that, still no Flash. Dammit.



FIGHTING ON NEW FRONTS

BlackBerry PlayBook

For starters, it's a 7-inch tablet: if you can live with this form factor, you're already in line for conversion. The operating system is easy to understand and the tablet's performance is downright amazing, especially for Web browsing (yes, it comes with Flash!) and multi-tasking (the touchscreen is really good). Having played with one for a couple of weeks, we admit to being mildly besotted.

You get dual HD cameras for video capture and video conferencing (they can record HD video at the same time) and an HDMI-out port for presenting your creations on an external display. If you own a BlackBerry smartphone, you can pair the tablet and phone using a secure Bluetooth connection, allowing you to use the larger tablet display to seamlessly and securely view e-mail, BBM, calendar, tasks, documents and other content that resides on the phone. But where are the cool apps?

HP TouchPad

Only just released in the United States, HP's TouchPad tablet – powered by a dual-core 1,2 GHz Qualcomm Snapdragon processor – is available in 16 GB and 32 GB versions and comes with a beta version of Adobe's Flash browser plug-in, a 9,7-inch multitouch screen and a 1,3 MP front-facing webcam. It's the first tablet to run WebOS, the operating system acquired by HP last year when it bought Palm, which means that this tablet uses the same card-stack system for organising its apps. This is good, by the way.



Samsung Sliding PC 7

It looks like a regular 10,1-inch tablet, but the slide-out keyboard turns it into something completely different, and strangely appealing. We have many friends and colleagues who've spent a few hundred bucks on Bluetooth keyboards for their tablets; is this a better solution? Anyway, this device comes with a 1 366x768 screen, a solid-state drive of up to 64 GB, 2 GB of RAM, and built-in 3G and WiMAX chips. That's all good, but the price is less appealing.



ASUS Eee Pad Transformer

It may be significant that when this device became available for online purchase in the US, it sold out within a day. In essence, it's a 10-inch tablet (powered by a dual-core NVIDIA Tegra 2 CPU running Android 3.0) that features an optional keyboard dock. That alone sets it apart from the herd, but what makes it more interesting is that the dock provides an extended battery life of up to 16 hours. (We featured this tablet in our March issue).



Panasonic Toughbook

If you're an outdoors type, you'll enjoy Panasonic's "ruggedised" Toughbook 10,1-inch tablet, which will run an Android operating system (we're not being told which one) and is due for release later this year. Aimed primarily at enterprise users, it comes with GPS connectivity, a non-glare screen that can apparently be read easily in sunlight, and an optional 3G/4G embedded modem. We understand its security system will be embedded at the hardware level.

Motorola Xoom

This Android 3.1-powered tablet could just give the mighty iPad 2 a run for its money (although when you look at the sales figures, this may be hard to believe). It comes with impressive specs and desirable built-in apps such as Gmail, Google Maps and Google Calendar; the downside is a sparsely populated library of other apps. It features the nVidia Tegra 2 Processor, 1 GB DDR2 RAM, Flash 10.2, and 32 GB of onboard storage. Other features include a 5 megapixel rear-facing camera capable of recording 720p video, a 2 MP forward-facing camera, and HDMI output. We reckon the Xoom's browser (think Chrome) is better than the iPad's Safari.



E-READER SHOWDOWN

Amazon Kindle 3G

Amazon's e-reader, with its 6-inch monochrome display and clear E Ink Pearl technology, has been the best-selling item in Amazon's vast product line-up for two years running; this *must* be significant. The Kindle stores up to 3 500 books, downloading your choice (we paid an average of about R70 each for best-sellers, or less than half of the regular paperback price in bookstores) via "Whispernet" in a matter of seconds.

The process is seamless,

allowing you to carry on reading while your latest selection is downloaded via Wi-Fi or 3G (which is free, by the way; Amazon pays for it). Your credit card, linked to Amazon, is billed automatically. You can read your e-books in bright sunlight (we know, because we tried it) but unlike the backlit Nook, you'll need a bedside light – or a folder with a built-in light – once the daylight has faded.

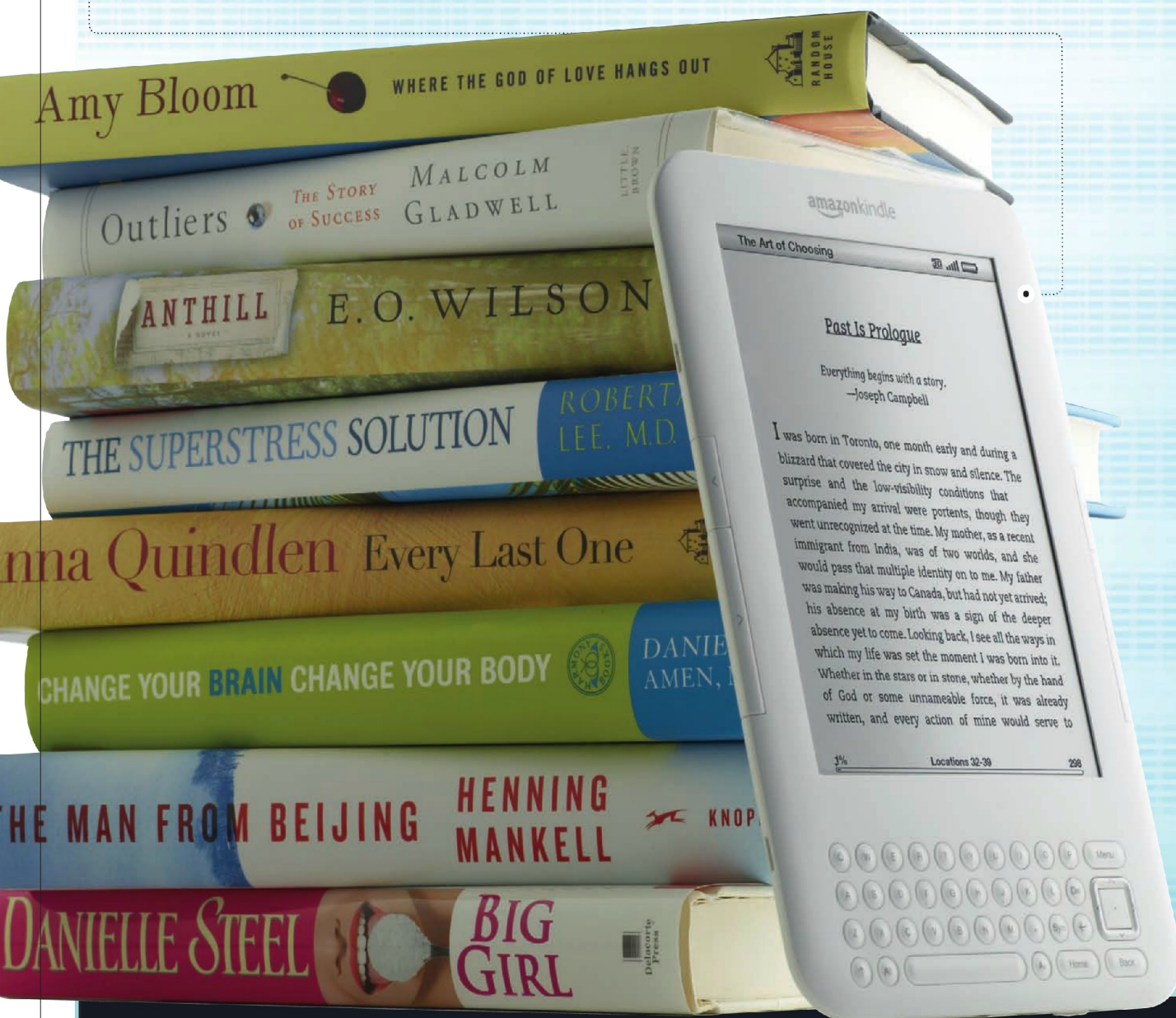
It gets better. Click on the

"Experimental" menu item and you'll discover a basic browser, an MP3 player (listen to podcasts or music) and a text-to-speech function that reads text to you in a Stephen Hawking sort of voice. If you've never tried an e-reader, you're in for a thoroughly satisfying experience – and all for R1 300 (Wi-Fi and 3G model). If you have a wireless setup at home, you can buy the Wi-Fi-only version for about R955.

Did we mention free books?

Well, Kindle (and Barnes & Noble, come to think of it) has a vast storehouse of out-of-copyright classics that can be had for nothing, zilch. We've already downloaded the *Complete Works of William Shakespeare*, *Alice's Adventures in Wonderland*, and a couple of PG Wodehouse books we remember from our dad's collection. In short, we love it.

Amazon also sell a larger-format kindle, the 9,7-inch Wi-Fi-only DX, for about R2 600.



It's a hotly contested category, with new protagonists entering the e-reader fray virtually every month, but so far there are two clear leaders. For the record, the battle has only just begun...

Barnes & Noble Nook Color

Devotees believe this device deserves its own category in a space somewhere between e-readers and tablets, especially since its upgrade to Android 2.2 Froyo and the launch of a dedicated app store. The most significant differences between the Nook Color and Amazon's market-leading Kindle 3G are the display and battery life: the Nook has a full-colour touchscreen and delivers around 8 hours of work/play, whereas the monochromatic Kindle has a physical QWERTY keypad and provides up to two months between charges (with Wi-Fi deactivated).

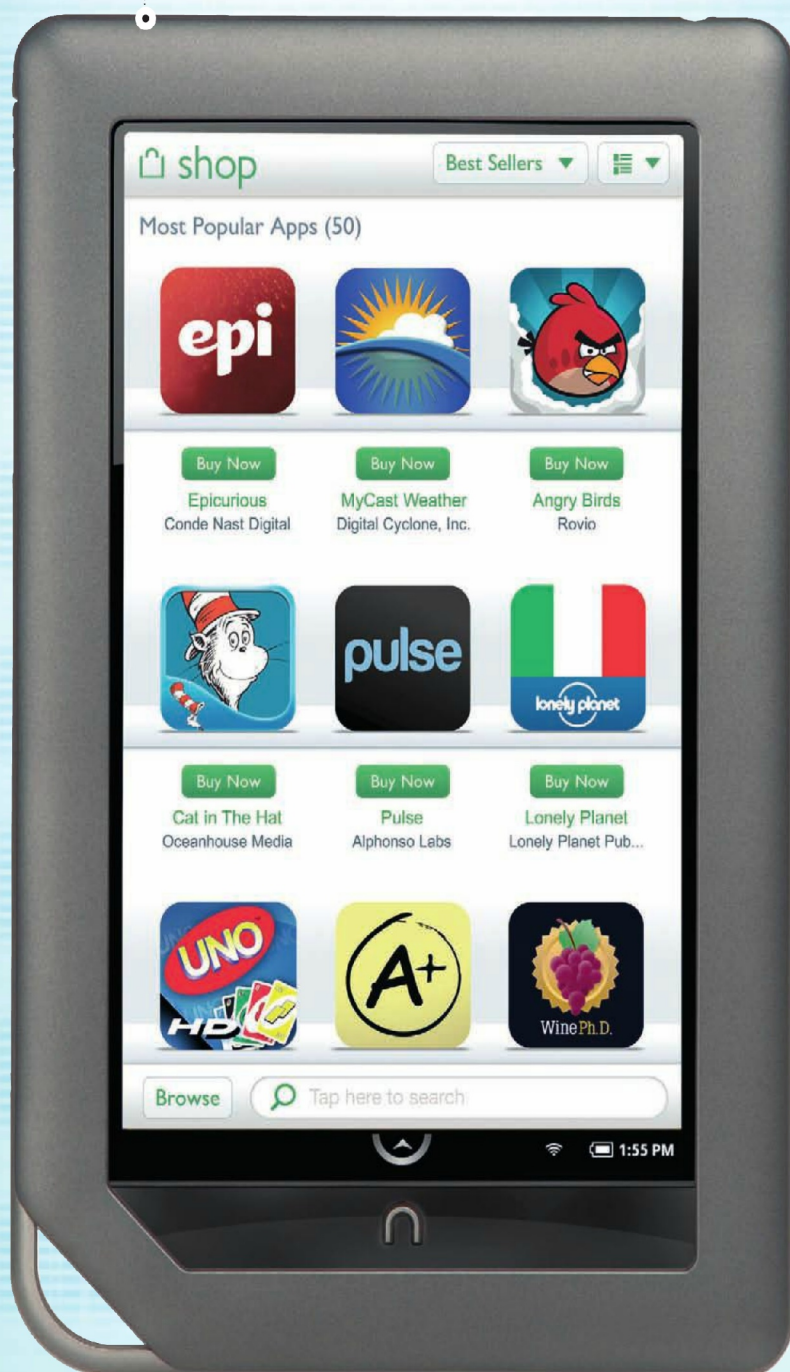
Aside from its seamless delivery of digital books, interactive magazines, newspapers and other stuff from Barnes & Noble's vast database (over 2 million titles), you get popular apps, e-mail and enhanced Web browsing – and all in immersive, gorgeous colour. It's a neatly designed device, with a graphite finish and a soft-touch back that makes holding it strangely pleasurable. Featuring a 7-inch display, it measures just 206 mm by 127 mm, and weighs 448 grams.

The Nook provides you with a perfectly adequate Web experience, whereas the Kindle's "experimental" browser – though undoubtedly useful – is somewhat clunky. You also get an 8 GB memory (extendable via microSD card) that's capable of storing up to 6 000 titles. Neat, sexy and capable... and according to converts, well worth the \$249 (about R1 700) price tag.

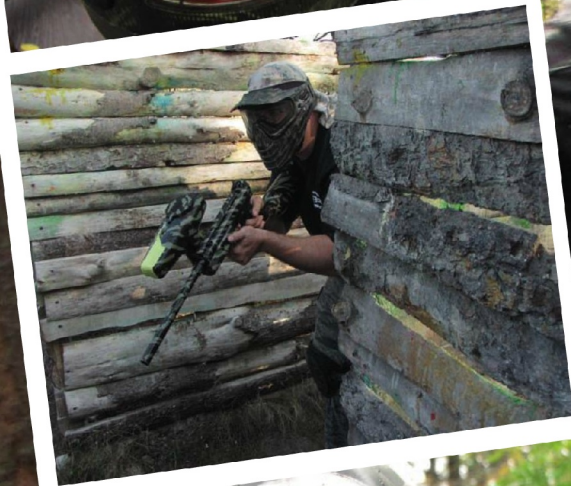
However – and this is a rather significant "however" for potential buyers from South Africa – Barnes & Noble say that in terms of their agreement with publishers, they may not deliver e-books outside the United States. So why have we bothered to feature the Nook? Two reasons: first, we understand they are trying to negotiate a deal whereby they can make their titles available to the rest of the world; and second, although B&N's system will recognise your non-American IP address and probably reject your approach, there are ways to circumvent this (check it out via Google; it's a slightly grey legal area).

You can view personal files by transferring PDF, ePub, PNG, GIF and BMP files to the device, and Quickoffice software allows you to view Word, Excel and PowerPoint files. (For the record, one PM staffer has bought a Nook Color; others are tempted.)

The smaller (monochrome) Nook touch reader sells in the US for just under R1 000. **PM**



[OUTSIDE]



SPLAT – you're dead

Weekend warriors make new-wave paintball war games seem almost like the real thing

WORDS AND PICTURES BY SEAN WOODS

Woodsball, bushball or scenario play – whatever it's called, this paintballing craze delivers the adrenaline rush, tense anticipation and kick-ass action you'd only ever get to experience in the heat of real combat. And it's taking South Africa by storm.

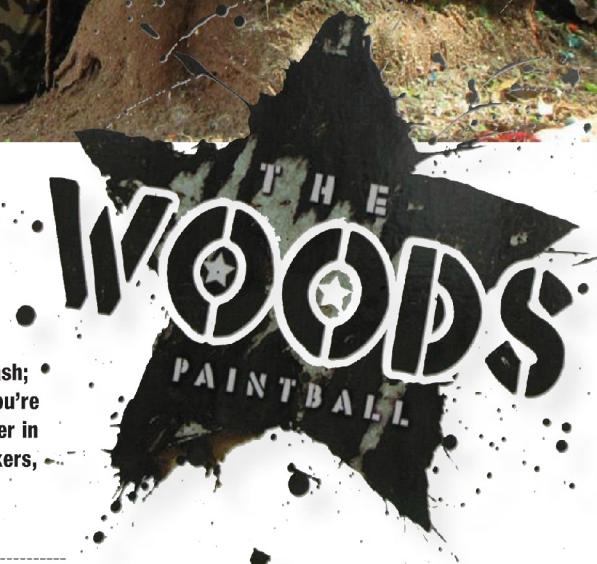
Realistic-looking weaponry, cool camo gear and cocky swaggers aren't necessarily prerequisites for this new fun-filled sport. Cunning, not to mention co-ordinated

teamwork, most certainly is. (That said, decking yourself out Rambo-style and toting hardcore ordinance does up the ante.)

It's not exactly the most politically correct thing to admit, but let's face it: most boys (okay, and some girls) really enjoy playing with guns. Actually, one could argue that if you're a guy, a healthy fascination with macabre weaponry is a genetic imperative. After all, male *Homo sapiens* has banded together in small co-ordinated groups to

stalk prey, kill it, and then eat it since dawn of time. Oh yes, then there's that dirty three-lettered word – war.

Well, whether we're being true to our genes or simply playing hard over weekends to let off some accumulated steam after a tough week at the office, woodsball has become wildly popular. It's worlds apart from its mainstream cousin, speedball, the more common style seen on sports channels. Speedball uses flat, prepared



ON THE WEB > Visit www.popularmechanics.co.za to see Sean Woods getting down and dirty with the paintball warriors. Also look out for his blog on his experience.

Left top to bottom: Paintballs may sting or bruise, but clothing stains vanish after a good wash; Paintball Africa's Wayne Smith stalks an opponent in "Little Mogadishu"; when you're hit, you're out. Main images, left to right: Unlike speedball, woodsball is played on uneven ground, either in natural woodland settings or mock urban environments created with obstacles such as bunkers, trenches and narrow passages.

fields and inflatable obstacles. Woodsball is played on uneven ground, either in natural woodland settings or mock urban environments bedecked with bunkers, trenches, narrow passages and the like.

Paintballing was invented by North American lumberjacks to mark trees designated for felling. Guys being guys, it wasn't long before one of them took aim at his buddies. You could argue that woodsball has taken the sport back to its roots.

GAMES WOODSBALLERS PLAY

Games can take on a number of formats, depending on the amount of players per team, the experience level of players or simply everyone's agenda for that day. Paintball Africa's Wayne Smith explains: "Sometimes we play straight elimination rounds because they go quicker. That way, we can get in more games over a weekend.

"Then there's 'capture the flag': a flag is placed in the centre of play, and the team

that manages to retrieve it and get it back to their side of the field wins. Other scenarios include games such as 'defend the fuel dump', where the (attackers) have a limited time to take out the defending team."

Paintball Africa's range is situated near Morningstar north of Cape Town. It has two fields; one accommodates the faster-paced (and more spectator-friendly) speedball style, and the other hosts woodsball. The woodsball field is a warren of bunkers,



Top: Brothers of Destruction team member Gareth Rens with his weapon of choice – a Tippman Sierra One. **Left, top to bottom:** Sniper André Rossouw settles into the undergrowth and waits for an unsuspecting opponent; seasoned paintballer Mike Fletcher prefers using his Airwgun marker as he enjoys the greater challenge; teams may show no mercy on the field, but once play is over, camaraderie rules.

trenches and wooden structures placed to simulate urban warfare. In pride of place in the centre is "Little Mogadishu", a structure of tight alleyways, few windows and multiple entrances. The Somali name came about during a "Black Hawk Down" scenario used for a competition. Says Smith, "Players can only shoot through the windows and doorways. You never know what you'll bump into when negotiating the winding passages... it makes for some really tense, fast-paced action!"

In Johannesburg, near Fourways, you'll find The Woods – a range comprising

five fields, all dedicated to woodsball. Four of the fields have a mix of haystacks, wooden bunkers, netting, trees and bushes. All of these can accommodate 20 to 30 players, and each one is set up differently for a unique gaming experience.

The fifth field is a huge area of natural countryside, covered in trees with patches of open grassland. As it takes about 10 minutes to get from one end to the other on foot, here you can give full rein to all your military fantasies. Up to 100 players can be accommodated at any one time; as you might expect, drawn-out raging battles tend to ensue.

The usual modus operandi on the big fifth playing field is for one team to be given a good head start, allowing them the opportunity to hide and set up their positions before the opposing team goes on the hunt. Here camo gear and cat-and-mouse tactics are vital. As are, of course, mad dashes and frantic dives for cover. The team with the best strategy, communication and leader (yes, they structure themselves just like real army units) invariably wins.

Gareth Rens, a member of the Brothers of Destruction team (all the hardcore military simulation teams have cool names) regularly travels from his home in Vereeniging to The Woods to get his fix. Says Rens, "We usually stick around for the entire day and play until we're tired, or until we've run out of paint!"

André Rossouw spent his national service in the infantry, and hits The Woods regularly to have fun, relive his army days and keep fit. "Woodsball is the closest you can get to actual warfare," he says. An elec-



GEARING UP

Serious woodsball players equip themselves properly, not just to look the part, but also to ensure that they "survive" and that their opponents don't. Here's a selection of cool gear to help you get started.



GET READY FOR WAR

If military scenario play tickles your fancy, then you really need Tippmann's Sierra One marker. Based on the US military's Heckler & Koch HK416 modular assault rifle, it's made out of metal to give it a realistic weight and feel. Features include a high-performance 28 cm quick tread barrel, collapsible stock, stainless steel gas line and proven high performance in-line bolt system. Price: about R1 850. Contact Paintball Africa on 021-551 3115 or visit www.paintball.co.za



CUSTOM FRIENDLY

Those wanting to customise their ordinance won't go wrong with Tippmann's 98 Custom Basic marker, which is capable of using CO₂, compressed air or nitrogen gas. This semi-automatic has a firing rate of 8 balls per second and boasts a split receiver design, providing easier access to internal components for simplified installation of grip upgrades and modifications. Price: about R1 500. Contact Paintball Africa on 021-551 3115 or visit www.paintball.co.za



SMALL SHOOTER

The BT SA-17 pistol marker boasts a precision milled aluminium body for durability and spring feed system. Its quick-change CO₂ system and easy feed tube loading (it holds 10 rounds) means you won't get caught short when the enemy counter-attacks. Interestingly, it also accommodates pepper, ceramic and nylon balls, making it a great self defence weapon for around the home. Price: about R1 450. Contact Paintball City on 011-828 7583 or visit www.paintballcity.co.za



FAST ELIMINATOR

Dye Paintball's new Proto Reflex Rail is more of a speedball marker, but it's lightweight and can shoot up to 25 balls per second - giving woodsballers the edge when it comes to manoeuvrability and a blistering rate of fire. Other features include all-aluminium construction and programmable control with four tournament modes. Price: about R3 400. Contact Paintball City on 011-828 7583 or visit www.paintballcity.co.za

FACE PROTECTOR

Taking a hit on the body will produce little more than a bruise, and laughter from your mates, but getting hit in the face can have serious consequences. The Proto Switch FS Camo mask provides players with exceptional vertical and horizontal vision. Its multi-ported earpiece facilitates unrestricted audible transfer; uni-directional venting reduces lens fogging and allows you to breathe easy. Price: about R650. Contact Paintball Africa on 021-551 3115 or visit www.paintball.co.za



TAKE AIM, FIRE

Sniper wannabes are sure to benefit from using NcStar's DBB130 Red Dot Sight. In a black anodised aluminium body, it features a seven-position rheostat knob for multiple brightness settings. You also get an integrated weaver style mount and a ruby lens coating. Price: about R450. Contact Paintball Africa on 021-551 3115 or visit www.paintball.co.za



WHAT A BLAST

In the real world, landmines are a scourge we can all do without. In woodsball, they're simply a blast. The M80 Landmine was originally developed for military war game training, making it ideal for woodsball. Powered by a standard 12-gram CO₂ cartridge, its marking agent is a highly visible fluorescent paint or smoke simulation powder. It's also reusable. And, if you include the optional Burst Tube you get a seriously loud bang. Price: about R600. As it's not a regular item, Paintball Africa don't hold any in stock, but if you want one they can get it. Contact them on 021-551 3115 or visit www.paintball.co.za



BLENDING IN

Who needs standard camo when you can wear a nice, lightweight ghillie suit? Originally developed by Scottish gamekeepers as a portable hunting hide, it's a must for woodsballers who want to ambush the opposition. The lightweight, synthetic string material is scentless, hand-washable, fire and mildew-resistant. Its shell is made of netting, allowing users to insert natural vegetation to alter its camo pattern further. Price: about R1 050. Contact Parktown Stores on 012-335 2740 or visit www.parktownstores.co.za

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**BEAR
GRYLLS**



Introducing the Gerber Bear Grylls Survival Series of gear. This collaboration brings together Gerber's over 70 years of knife and gear expertise with Bear Gryll's extensive outdoor survival and adventure experience to create a one-of-a-kind line of knives, tools and gear. From his time in the British SAS, to scaling Mount Everest, to hosting his survival television show all over the globe, Bear knows what it takes to be a survivor in extreme situations. Each item in the Survival Series is meticulously designed by Gerber and Bear to offer a multitude of uses in any environment.

Folding Sheath Knife

Suggested Retail: R 549.00



Parang

Suggested Retail: R 549.00



Fire Starter

Suggested Retail: R 219.00



8 Piece Survival Kit

Suggested Retail: R 329.00



ULTIMATE KNIFE™

The Ultimate Knife is the pinnacle of Gerber's Bear Grylls Survival Series. Intricately designed by Gerber and Bear, it is loaded with innovations that won't be found in any other fixed blade knife. Like everything in the survival series, it also includes Bear's Priorities of Survival Pocket Guide. Super useful in the wild, it offers a vital edge to any survivor.



Suggested Retail: R 869.00

Knife Features:
½ Serrated High Carbon Stainless Steel
Drop Point Blade- ideal for edge retention and cutting rope
Ergonomic textured rubber grip - maximizes comfort and reduces slippage
Stainless Steel Pommel- At base of handle for hammering
Emergency Whistle - In lanyard cord

Sheath Features: Fire Starter - Ferrocerium Rod locks into sheath, Striker notch incorporated into back of knife blade.
Nylon Sheath - Lightweight, military grade, mildew resistant.

Land to air rescue instructions. Diamond Sharpener - integrated into sheath for on-the-go sharpening



Compact Scout Knife

Suggested Retail: R 279.00



Scout Knife

Suggested Retail: R 439.00



Ultimate Multi-Tool
Suggested Retail:
R 759.00



Compact Multi-tool
Suggested Retail:
R 269.00

SO YOU'RE IN A SPOT OF TROUBLE.

WELL, YOU AREN'T THE FIRST AND YOU SURE WON'T BE THE LAST - SO HAVE FAITH AND KEEP YOUR HOPE UP - WHETHER YOU MAKE IT OUT ALIVE OR NOT WILL LARGELY COME DOWN TO YOU: YOUR ATTITUDES AND YOUR ACTIONS

Bear

Included with every Product: **Priorities of Survival Pocket Guide**



ULTIMATE KIT™



15 Piece ULTIMATE Survival Kit
Suggested Retail: R 649.00

Available at leading outdoor retailers
www.beargrylls.co.za

EXPERT SURVIVOR. EXTREME GEAR.



Top: Johnathan Attfield shows off his highly modified BT4 Combat marker. Middle: Markers using compressed air boast much more consistent velocities than their CO₂ powered counterparts. Below: To play things safe, markers get regularly tested by range personnel to ensure their firing velocities never exceed 91 metres per second.



trical contractor by trade, on weekends he dons his camo gear, slings his modified BT Combat marker (paintballers use markers, not guns) over his shoulder and becomes a sniper. "I modified my marker by adding a longer barrel, fitted a butt and gave it a custom spray job. I still intend getting a tripod, electric trigger and electric ball feeder," explains Rossouw. "But all the modifications we make are basically cosmetic. With a basic marker you can play as good as the next guy – we do it just for fun, really."

Another seasoned woodsballer and frequent visitor to The Woods, Mike Fletcher, prefers playing with an Airowgun marker. This is a paintball attachment that can be fitted to "virtually any bow you can think of". His rationale is simple: having owned his own paintball range once, and with years of experience under his belt, he wanted a greater challenge.

Last year paintball was registered as an official sport in SA, and plans are underway to create a structured, national league

for woodsball enthusiasts. Driving this effort is Paintball City's Nick Birch.

Birch started a series last year with just two teams and now regularly caters for 12 at his Germiston field. The layout boasts double storey towers for snipers and thatched huts to give it a distinct Vietnam feel. Says Birch, "At present we operate on a first come, first served basis. But there's now so much interest that if we had the capacity we'd be able to accommodate 20! Teams are coming from as far as Potchefstroom, Pietersburg and even Tzaneen. Our plan is to give the sport structure so that teams can one day get their Springbok colours. To make sure this happens, we're in the process of negotiating with key players in the industry around the country."

● To find out more, contact Paintball Africa on 021-551 3115, Paintball City on 011-828 7583 or The Woods paintball range on 084 911 1000. Alternatively, visit www.paintball.co.za/forum PM

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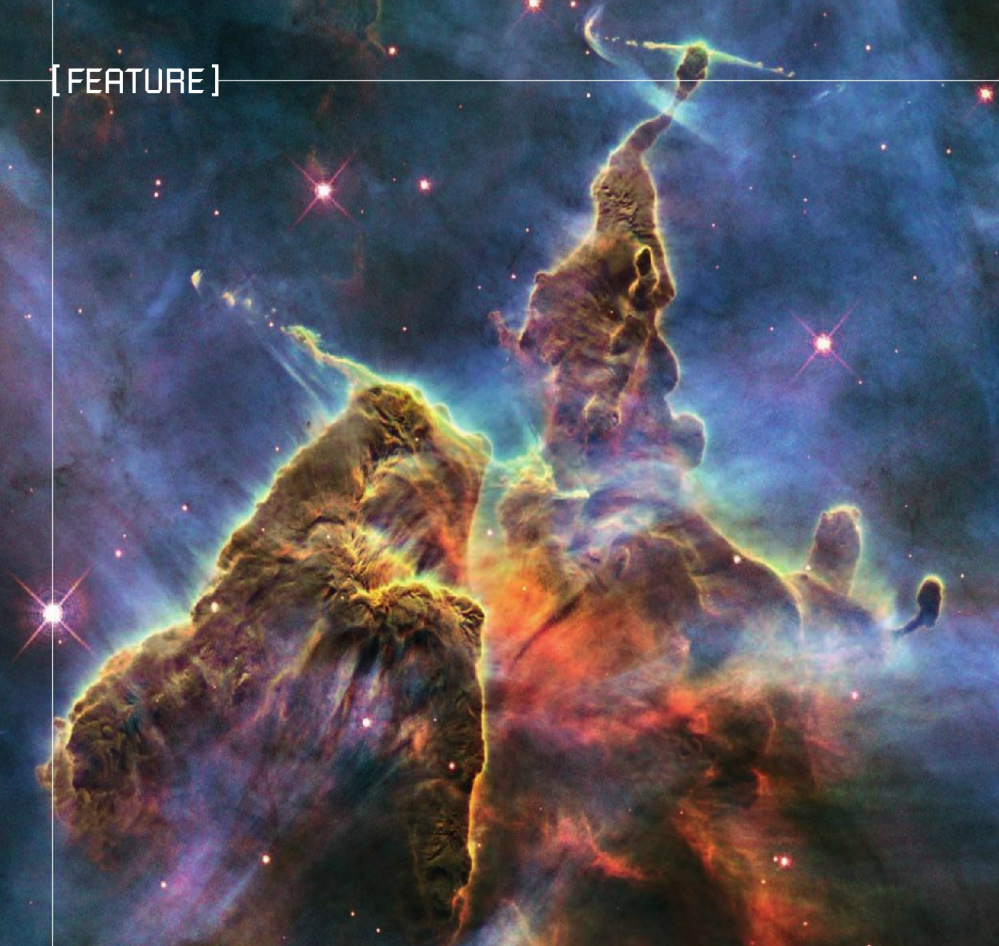
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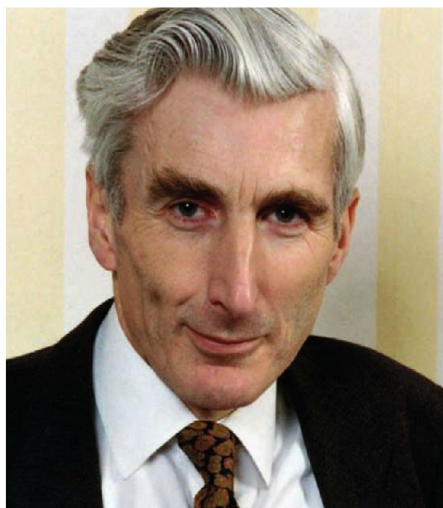
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Edging AHEAD

Once a year, an intellectually provocative Web site called *Edge* challenges some of the world's smartest and most perceptive people to answer a new question. This year, they were invited to consider the following: **'What scientific concept would improve everybody's cognitive toolkit?'** We present three of the 159 responses...



Deep time and the far future

MARTIN REES

President, The Royal Society; Professor of Cosmology and Astrophysics; Master, Trinity College, University of Cambridge; author of *Our Final Century: The 50/50 Threat to Humanity's Survival*.

We need to extend our time-horizons. Especially, we need deeper and wider awareness that far more time lies ahead than has elapsed up till now. Our present biosphere is the outcome of more

than four billion years of evolution, and we can trace cosmic history right back to a "Big Bang" that happened about 13,7 billion years ago.

The stupendous time-spans of the evolutionary past are now part of common culture and understanding – even though the concept may not yet have percolated through to all parts of Kansas (and Alaska).

But the immense time-horizons that stretch ahead – though familiar to every astronomer – haven't permeated our culture to the same extent. Our Sun is less than halfway through its life. It formed 4,5 billion years ago, but it's got 6 billion to go before the fuel runs out. It will then flare up, engulfing the inner planets and vaporising any life that might remain on Earth.

But even after the Sun's demise, the expanding Universe will continue – perhaps forever – destined to become ever colder, ever emptier. That, at least, is the best long-range forecast that cosmologists can offer, though few would lay firm odds on what may happen beyond a few tens of billions of years.

Awareness of the "deep time" lying ahead is still not pervasive. Indeed, most people – and not only those for whom this view is enshrined in religious beliefs – envisage humans as in some sense the culmination of evolution.

But no astronomer could believe this; on the contrary, it would be equally plausible to surmise that we are not even at the halfway stage. There is abundant time for post-human evolution, here on Earth or far beyond, organic or inorganic, to give rise to far more diversity, and even greater qualitative changes, than those that have led from single-celled organisms to humans. Indeed, this conclusion is strengthened when we realise that future evolution will proceed not on the million-year timescale characteristic of Darwinian selection, but at the much accelerated rate allowed by genetic modification and the advance of machine intelligence (and forced by the drastic environmental pressures that would confront any humans who were to construct habitats beyond the Earth).

Darwin himself realised that "no living species will preserve its unaltered likeness into a distant futurity". We now know that "futurity" extends a lot further, and alterations can occur far faster – than Darwin envisioned. And we know that the cosmos through which life could spread is far more extensive and varied than he envisaged.

So humans are surely not the terminal

branch of an evolutionary tree, but a species that emerged early in cosmic history, with special promise for diverse evolution. But this is not to diminish their status. We humans are entitled to feel uniquely important as the first known species with the power to mould its evolutionary legacy.



The double-blind control experiment

RICHARD DAWKINS

Evolutionary biologist; Emeritus Professor of the Public Understanding of Science (Oxford); author of *The Greatest Show on Earth*.

Not all concepts wielded by professional scientists would improve everybody's cognitive toolkit. We are here not looking for tools with which research scientists might benefit their science. We are looking for tools to help non-scientists understand science better, and equip them to make better judgments throughout their lives.

Why do half of all Americans believe in ghosts, three-quarters believe in angels, a third believe in astrology, three-quarters believe in Hell? Why do a quarter of all Americans believe that the President of the United States was born outside the country and is therefore ineligible to be president? Why do more than 40 per cent of Americans think the Universe began after the domestication of the dog?

Let's not give the defeatist answer and blame it all on stupidity. That's probably part of the story, but let's be optimistic and concentrate on something remediable:

We are not alone in the Universe

J CRAIG VENTER

Acknowledged as one of the leading scientists of the 21st century for his invaluable contributions in genomic research, most notably for the first sequencing and analysis of the human genome (published in 2001) and the most recent and most complete sequencing of his diploid human genome. Co-founder and head of Synthetic Genomics, Inc.



I cannot imagine any single discovery that would have more impact on humanity than the discovery of life outside of our solar system. There is a human-centric, Earth-centric view of life that permeates most cultural and societal thinking. Finding that there are multiple, perhaps millions of origins of life and that life is ubiquitous throughout the Universe will profoundly affect every human.

We live on a microbial planet. There are one million microbial cells per cubic centimetre of water in our oceans, lakes and rivers; deep within the Earth's crust and throughout our atmosphere. We have more than 100 trillion microbes on and in each of us. The Earth's diversity of life would have seemed like science fiction to our ancestors. We have microbes that can withstand millions of Rads of ionising radiation; such strong acid or base that it would dissolve our skin; microbes that grow in ice and microbes that grow and thrive at temperatures exceeding 100 degrees.

We have life that lives on carbon dioxide, on methane, on sulphur, or on sugar. We have sent trillions of bacteria into space over the last few billion years and we have exchanged material with Mars on a constant basis, so it would be very surprising if we do not find evidence of microbial life in our solar system, particularly on Mars.

The recent discoveries by Dimitar Sasselov and colleagues of numerous Earth and super Earth-like planets outside our solar system, including water worlds, greatly increases the probability of finding life. Sasselov estimates approximately 100 000 Earths and super-Earths within our own galaxy. The Universe is young, so wherever we find microbial life there will be intelligent life in the future. Expanding our scientific reach further into the skies will change us forever.

lack of training in how to think critically, and how to discount personal opinion, prejudice and anecdote, in favour of evidence.

I believe that the double-blind control experiment does double duty. It is more than just an excellent research tool. It also has educational, didactic value in teaching people how to think critically. My thesis is that you needn't actually do double-blind control experiments in order to experience an improvement in your cognitive toolkit. You only need to understand the principle, grasp why it is necessary, and revel in its elegance.

If all schools taught their pupils how to do a double-blind control experiment, our cognitive toolkits would be improved in the following ways:

1. We would learn not to generalise

from anecdotes.

2. We would learn how to assess the likelihood that an apparently important effect might have happened by chance alone.

3. We would learn how extremely difficult it is to eliminate subjective bias, and that subjective bias does not imply dishonesty or venality of any kind. This lesson goes deeper. It has the salutary effect of undermining respect for authority, and respect for personal opinion.

4. We would learn not to be seduced by homeopaths and other quacks and charlatans, who would consequently be put out of business.

5. We would learn critical and sceptical habits of thought more generally, which not only would improve our cognitive toolkit, but might save the world.

● Visit Edge.org

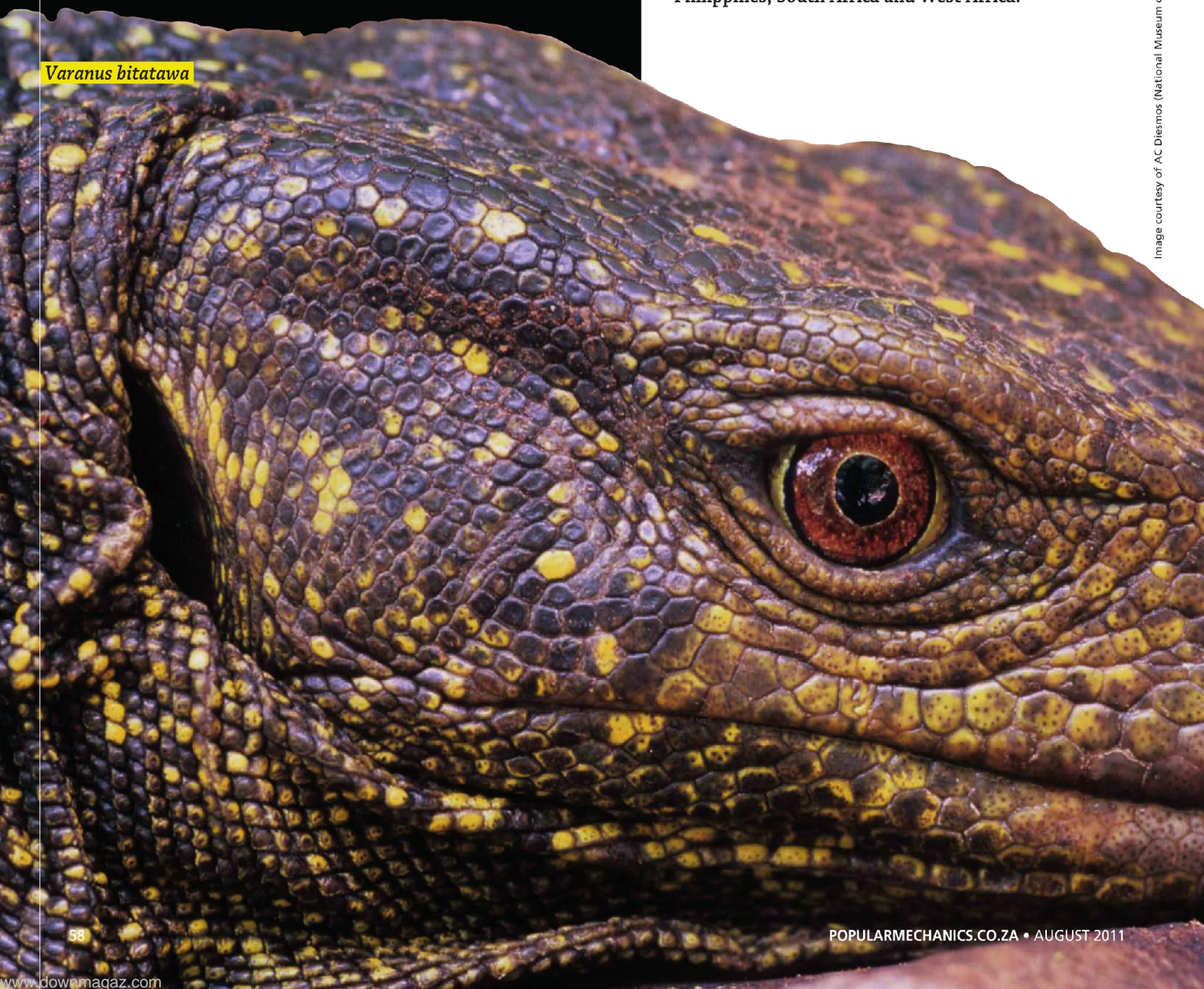
PM

Nature's new superstars



Halieutichthys intermedius

Varanus bitatawa



Low-in-the-dark mushrooms, a batfish flat as a pancake that appears to hop in the water, Titanic-eating bacterium, and a *T. rex* leech with enormous teeth are among the new species from 2010 selected as the top 10 by the International Institute for Species Exploration at Arizona State University and a committee of taxonomists from around the world – scientists responsible for species exploration and classification.

Also on the list are a cricket that pollinates a rare orchid, a rogue mushroom that fruits underwater, and an orb-weaving spider named after Darwin that builds webs large enough to span rivers and lakes. Rounding out the top 10 new species are a jumping cockroach, a 1,9 m-long fruit-eating lizard, and a duiker first encountered at a bushmeat market in Africa.

The announcement of this year's top 10 new species coincided with the anniversary of the birth of Carolus Linnaeus, the Swedish botanist who was responsible for the modern system of plant and animal names and classifications. This year's top 10 come from around the world, including Brazil, the Gulf of Mexico, the Mascarene Islands in the Indian Ocean, Madagascar, the North Atlantic Ocean, Oregon, Peru, the Philippines, South Africa and West Africa.

And the winners are...

Among this year's top 10 picks is a leech, less than 5 cm in length but with a single jaw and gigantic teeth, earning it the name *Tyrannobdella rex*, which means "tyrant leech king". Found in Peru, this leech was discovered attached to the nasal mucous membrane of a human. According to the scientists who reported the discovery, there are 600 to 700 species of described leeches, yet there could be as many as 10 000 more throughout the world.

A top 10 choice in the fish category is a pancake batfish that lives in waters either partially or fully encompassed by the 2010 oil spill in the Gulf of Mexico. Named *Halieutichthys intermedium*, this bottom-dwelling species seems to hop on its thick, arm-like fins as it moves awkwardly in the water, resembling a walking bat. John Sparks, curator of ichthyology at the American Museum of Natural History, one of the scientists who reported the discovery, said: "If we are still finding new species of fishes in the Gulf, imagine how much diversity, especially microdiversity, is out there that we do not know about."

At 1,9 m in length, a frugivorous (fruit-eating) monitor lizard found in the Northern Sierra Madre Forest on Luzon Island in the Philippines is the longest species to make this year. Weighing just under 10 kg, this species is brightly coloured, with stripes of gold flecks. Its scaly body and legs are blue-black mottled with pale yellow-

green dots and its tail is marked in alternating segments of black and green. Named *Varanus bitatawa*, this lizard spends most of its time in trees and has become a flagship species for conservation in the Philippines.

The Silvermine Nature Reserve, part of our very own Table Mountain National Park, is home to another character on this year's top 10 list – a new species of cockroach that exhibits unusual morphology with legs that are highly modified for jumping. Named *Saltoblattella montistabularis* – *Saltoblattella* is the Latin translation of "jumping small cockroach" – this critter has jumping ability that is on par with grasshoppers. Prior to its discovery, jumping cockroaches were known only from the Late Jurassic. In addition to the leg modifications, it has hemispherical rather than kidney-shaped eyes, which protrude from the sides of the head, and its antennae have an additional fixation point to help stabilise it when jumping.

A new duiker (antelope) from West Africa was first encountered at a bushmeat market – a surprising find, according to the scientists who reported the new species in *Zootaxa*. "The discovery of a new species from a well-studied group of animals in the context of bushmeat exploitation is a sobering reminder of the mammalian species that remain to be described, even within those that are being exploited on a daily basis for food or ritual activities," wrote Marc Colyn from the University of Rennes, France, and his co-authors. The species is named *Philantomba walteri* or "Walter's Duiker" for the late Walter Verheyen, in honour of his work on African mammals. Verheyen reportedly collected the first specimen at Badou, Togo, in 1968.



Saltoblattella montistabularis

Images courtesy of Mike Picker (University of Cape Town)



Tyrannobdella rex

PLOS ONE



Zootaxa

Yann LE BRIS

Also making the list is the iron oxide-consuming bacterium that was discovered on a rusticle from the RMS *Titanic* and named *Halomonas titanicae* by a team of scientists from Dalhousie University in Canada and the University of Seville in Spain. The passenger steamship *Titanic* struck a massive iceberg in 1912 on its maiden voyage and sank deep in the Atlantic Ocean. Studies show that the bacterium sticks to steel surfaces, creating knob-like mounds of corrosion products. Researchers believe this bacterium could be useful in the disposal of old ships and oil rigs that lie deep in the ocean.

Glomeremus orchidophilus – a raspy cricket – made the top 10 list for its distinction of being the only pollinator of the rare and endangered orchid *Angraecum cadetii* on Réunion in the Indian Ocean's Mascarene Archipelago. The scientists who made the discovery wrote that this species, which belongs to a sub-family of crickets that make a raspy sound, represents the first supported case of regular pollination by an insect from the order Orthoptera in extant flowering plants.

Lighting up the top 10 is a luminescent fungus collected in São Paulo, Brazil, found on sticks in an Atlantic forest habitat. The teeny mushrooms, less than 8 mm in diameter with caps smaller than 2 cm across, have gel-coated stems that glow constantly, emitting a bright, yellowish-green light. San Francisco State University biology professor Dennis Desjardin and his colleagues, who made the discovery, named the new species *Mycena luxaeterna* (eternal light) after a movement in Mozart's "Requiem". Desjardin, who has discovered more than 200 new fungi species, noted that of the estimated 1.5 million species of fungi on Earth, only 71 species are known to be bioluminescent.

Scientists found a species of gilled mushroom in the northwestern United States submerged in the clear, cold, flowing waters of the upper Rogue River in Oregon. What makes *Psathyrella aquatica* distinct, and a member of this year's top 10, is that it was observed over a period of 11 weeks, fruiting underwater.

Rounding out the top 10 picks is an orb-weaving spider from Madagascar that was named for Charles Darwin – *Caerostris darwini*. The webs of Darwin's Bark Spider have been found spanning rivers, streams and lakes, and in one instance, a web stretched 30 m across

Courtesy of Sylvain Hugel (Université de Strasbourg, France)



Glomeremus orchidophilus



Caerostris darwini

Marija Kuntner (Scientific Research Centre of the Slovenian Academy of Sciences and Arts)



Halomonas titanicae

Image courtesy of RMS Titanic



Mycena luxaeterna

Cassius V Stevani (Instituto de Química, Univ de São Paulo, Brazil)



Psathyrella aquatica

Robert Coffan (Southern Oregon University, USA)

a Madagascar river – with at least 30 insects trapped in it. But length of the web isn't this species' only distinction. The silk spun by these spiders is more than two times stronger than any other known spider silk and reportedly 10 times stronger than a similar-sized piece of Kevlar.

"At the same time that astronomers search for Earth-like planets in visible space, taxonomists are busily exploring the life forms of the most Earth-like planet of all, our own," says Quentin Wheeler, an entomologist who directs the International Institute for Species Exploration at Arizona State University.

"We can only realistically aspire to sustainable biodiversity if we first learn what species exist to begin with. Our best guess is that all species discovered since 1758 represent less than 20 per cent of the kinds of plants and animals inhabiting planet Earth. A reasonable estimate is that 10 million species remain to be described, named and classified before the diversity and complexity of the biosphere is understood."

● Source: Arizona State University PM

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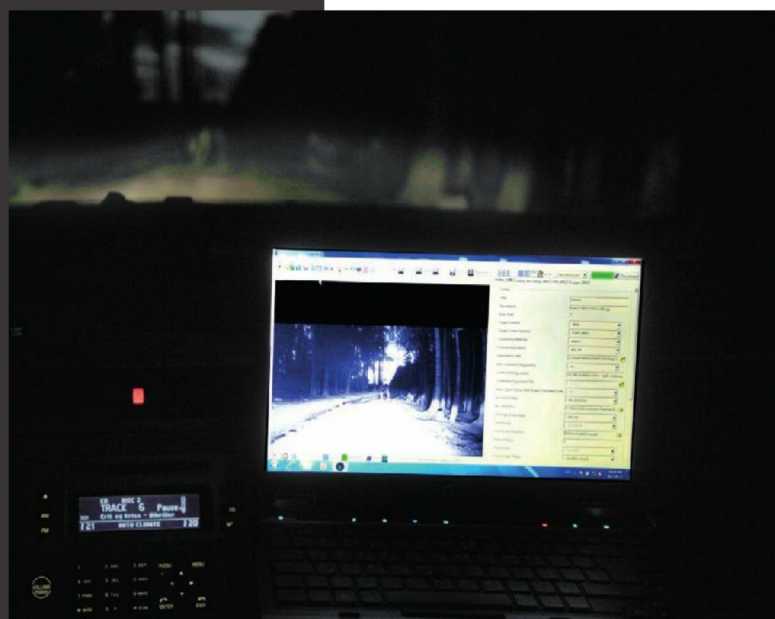
Car accessories

DRIVING AIDS AND COMFORT ACCESSORIES

You may think your vehicle is equipped with every conceivable driving aid and comfort accessory, but you're wrong. As we write this, legions of engineers and other clever people are developing concepts and technologies that are destined to become standard features. Does anyone remember when ABS was an expensive indulgence...?



STEERING CLEAR OF WILDLIFE, AUTOMATICALLY



Main picture: Movement patterns of large buck, drawn to fodder laid out to attract them, are logged by Volvo engineers developing a next-generation safety system that can help avoid collisions with animals. **Above:** The system consists of two parts – a radar sensor and a see-in-the-dark infrared camera.

Volvo is developing technology to avoid collisions with wild animals by alerting the driver and automatically braking the vehicle. The new system will be launched on the market in a few years' time. The project forms part of the company's vision for 2020: that nobody should suffer serious injury in a new Volvo. The new system is based on technologies from Pedestrian Detection with Full Auto Brake, introduced in 2010.

The system consists of two parts:

- A radar sensor;
- An infrared camera that can register the traffic situation.

Since most collisions with wild animals take place when visibility is limited, infrared is a must. The camera monitors the road ahead and if an animal is within range, the system alerts the driver with an audible signal. If the driver does not react, the brakes are applied automatically.

Says Andreas Eidehall, active safety technical expert at Volvo: "The goal is for the system to function at normal rural highway speeds. Where it cannot help the driver... avoid the collision, the system will slow down the car sufficiently to help reduce the force of impact and thus of serious injuries."

One challenge facing the engineers is to teach the system to recognise different animals. A development team from Volvo Car Corporation spent an evening at a safari park digitally logging film sequences of animals and their various behavioural patterns. On this particular evening, the focus was on moose, red deer and fallow deer. By driving very slowly along a trail where fodder had been laid out to attract the animals,

they managed to record a large volume of data which will be used to evaluate and develop the sensor system.

Many car drivers are highly concerned about the risk of collisions with wild animals – and there's good reason to be concerned. In Sweden alone, more than 40 000 accidents involving wild animals are reported every year. The greatest danger is from collisions with moose.

According to US Insurance Institute for Highway Safety statistics for the period 1993-2007, 2 499 people died in road accidents involving animals during this period. The report also states that the number of road accidents involving wild animals increases by almost 30 per cent in the northern winter. With South Africa's extensive road network in rural areas, where domestic and wild animals are found near roadways, there's relevance for us as well.

Says Eidehall: "In an impact with a moose, there is a relatively high risk of personal injury since it is common for the animal to end up on or roll across the front of the car and its windscreen." In South Africa's case, think kudu, stray cows...

CRANK IT UP

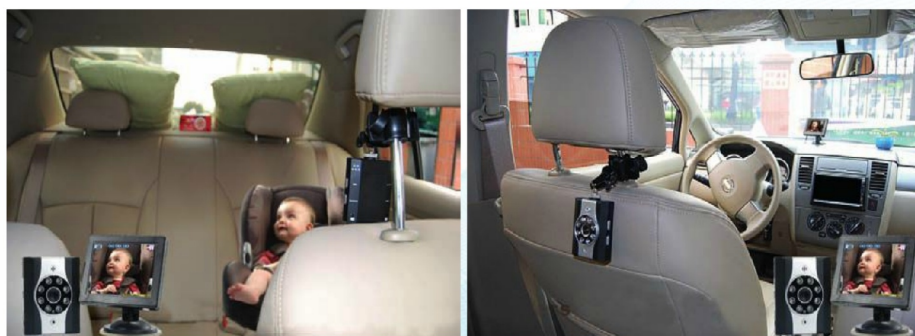
Sure, you can work up a sweat changing a flat the old-fashioned way, but why would you want to? Electromann's 12v electric car jack (model GB-A15) features a loading capacity of 1,5 tons and lifting range of 12 to 35 cm, taking the huff and puff out of raising your vehicle on the side of the road. There's also a manual crank, just in case your vehicle runs out of "juice". Price: about R500. Contact Electromann SA on 011-675 2360 or visit www.electromannsa.co.za



DIGITAL BABYSITTER

Monitoring your offspring's activities on the back seat while negotiating traffic can be a challenge, not to mention dangerously distracting. The solution: invest in a Wireless Car Baby Monitor with Night Vision + DVR, which allows you to keep an eye on Junior without having to turn your head.

Set-up is simple: all you need do is place the monitor on your car's dash and mount the camera behind your seat, facing the child. The built-in DVR functionality allows you to record your child's facial expressions and other spontaneous moments while you're behind the wheel. Video files are stored on to an SD memory card for easy viewing and file transfer, and it comes with infrared sensors, so you can monitor your child at night. Other specs: a rechargeable Li-Ion battery, USB 2.0 port, and a viewing angle of 72 degrees. Price: about R1 500. Contact Gadgets R Us on 074 140 6774 or visit www.gadgets-r-us.co.za



AVOID THAT DREADED FLASH

If letters of demand from the traffic department are wont to ruin your day, check out the Quintezz Spy solar-powered speed camera warning system. Completely legal, and featuring free lifetime downloads, updated monthly, this device could save you a fair bit of money and actually make you a safer driver.

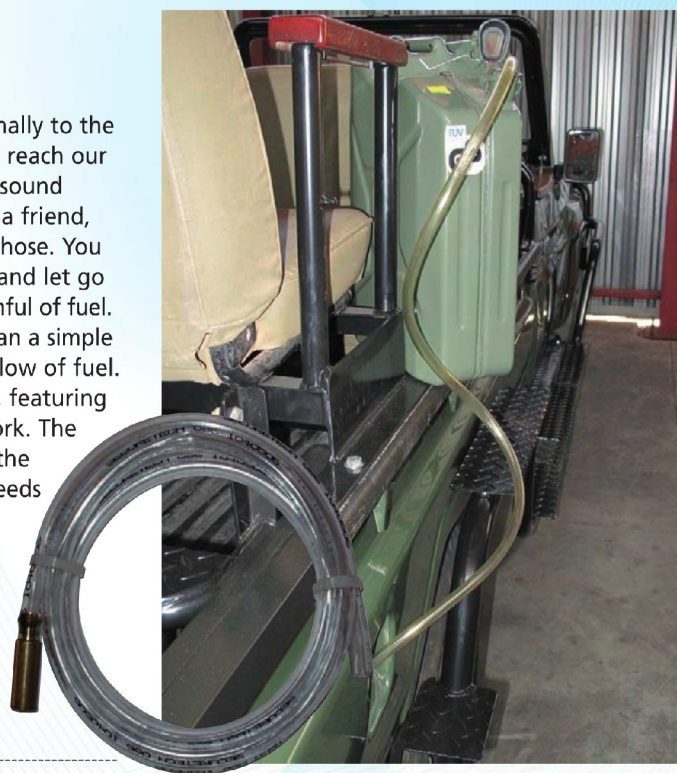
Here's how it works: if you're driving over the speed limit, the integrated SIRF III GPS detection system activates visual and audible warnings up to 500 m in advance of an obstacle or speed trap. The idea is to give you a chance to reduce speed and obviate a potentially dangerous knee-jerk reaction that might pose a danger to other road-users. The device slips into a holder that's attached to your car's windscreen with suction cups, and it comes with a car charger to complement the solar panel. Price: about R700. Contact Gammatek on 011-201 0800 or visit www.te-group.com



DON'T BE A SUCKER

We're all trying to stretch our petro-rands... occasionally to the extent of running the fuel tank dry in an attempt to reach our destination before the inevitable. This scenario may sound familiar: you're far from a petrol station, so you call a friend, who arrives with a plastic container and a length of hose. You suck vigorously on the hose to get the fuel going... and let go just too late, ending up with a yucky (and toxic) mouthful of fuel.

Enter the Super Siphon, which requires no more than a simple up-and-down shaking motion to ensure a constant flow of fuel. Its two-part, spark-resistant brass siphon mechanism, featuring a stainless steel spring and glass ball, does all the work. The clear, solvent-resistant hose enables you to monitor the flow of liquid from the container to the tank that needs to be filled. The device is suitable for transferring water, paraffin, petrol, diesel, two-stroke pre-mix and even aviation fuel. Marketed by SecureTech, it's available over the counter in lengths from 1,5 m to 3 m; longer units can be ordered. To get yours, e-mail michael@liftlash.co.za



quickpic



OH, THE POWER

In a road car, a 6-litre V8 engine churning out 453 kW and a tar-shredding 755 N.m might be considered over the top. In a pick-up, it's downright outrageous. But that kind of performance is par for the course for RGMotorsport, which lists a total of 16 Supercharged and over 40 Stage One Chev Lumina upgrades passing through the company's Strijdom Park Performance Centre in the last six years.

To put those performance figures in perspective: the stock Lumina SS develops 270 kW and 530 N.m. So, like conscientious tuners should, RGM promises to ensure that engine longevity is not compromised.

The good news for owners of the recently upgraded 2011 showroom models, is that over the years costs have been amortised, so the Supercharged engine package is more affordable than ever before and, for as little as R116 000, RGM can provide an extra 183 kW and 225 N.m.

Key features include the renowned Vortech centrifugal-type 'charger, with a high-pressure oil feed for both lubrication and cooling. They install dual fuel pumps (replacing both the one in the tank and adding another in-line) so that there is no risk of running lean, even at full load. A liquid charge cooling system with a 10-litre external tank ensures that intake temperatures remain as



motorspics

low as possible, even when running at 0,5 Bar pressure. Bespoke components such as pulleys and tensioners are crafted from aircraft-quality aluminium, and the engine management system is calibrated for driving in a wide variety of conditions. Supercharged installations carry a warranty of up to 3 years/100 000 km from date of first registration; a standard 6 months/20 000 km is offered on all conversions.



motorpics

PAMPER YOUR STEEDS

Getting to some of the finest cycling territory often (paradoxically) involves a drive. That simple necessity has spawned a booming market in bicycle carriers, from simple hang-on models to rooftop versions. Most popular, by far, seems to be the tow ball type, epitomised by Thule's new flagship bicycle carrier, the EuroClassic G6.

Early adopters will no doubt be impressed by the fact that the G6 is the world's first bike rack to use LEDs for its rear lighting. But there are other, highly practical reasons for choosing it.

The G6 is made primarily from aluminium, which – along with other high-tensile yet lightweight materials – enables it to tip the scales at just 14 kilograms in three-bike guise. It is designed to be secured to a tow ball in a few seconds, using just one hand. Still, its high load rating enables it to carry up to 75 kilograms of bicycle.

Load capacity can be increased to four bikes by adding a special adapter, and security is taken care of by a single key that locks the bikes to the rack and the rack to the car. A 13-pin power plug is compatible with the most modern CANBus car wiring system, ensuring operation of lighting and safety features such as trailer detection systems. Price: about R8 000.

LOOK, MA – NO WHEEL!

So you've seen it all? How about a folding steering wheel? US firm TRW Automotive Holdings has just unveiled a concept for a folding steering wheel that retracts into the dashboard to improve driver comfort when entering and leaving a vehicle.

Why bother? Explains company spokesman Manuel Poyant: "The automotive industry is being influenced by key factors such as a more active older population and the growth of megacities. As a result, vehicle manufacturers and suppliers need to find innovative solutions to improve driver accessibility and interior styling for smaller cars (that is, A- and B- platform as well as electric cars). "The foldable steering wheel concept is a prime example of technology that allows easier access for elderly people and those faced with mobility challenges."

The steering wheel features two retractable handles that close fully to create a smaller shape that folds away into the dashboard, significantly improving driver comfort and accessibility. When the vehicle is started, the steering wheel deploys into the driving position, which can be pre-set and saved by any driver in their preferred position. According to Poyant, customers have shown interest in the concept, and the introduction of the technology could happen within the next five years.

PM



WIN one of 2 Pirelli Scorpion Mountain Bikes!

To enter, answer the following question:

What is the Name of the eco-friendly SUV Tyre recently launched by Pirelli Tyre SA?

SMS: Pirelli, followed by the answer, your name and e-mail address to 32692 (R1 per SMS) or visit our Web site at www.popularmechanics.co.za. Competition closes 31 August 2011.

Pirelli's Scorpion Verde is the first high-performance eco-friendly tyre for vehicles with the highest environmental impact – SUVs and Crossovers. The new tyre has been created taking full advantage of all of Pirelli's latest research, encompassing a system that integrates new materials, structures and tread patterns in order to guarantee environment care. Direct benefits to the driver are fewer noxious emissions, less noise, better economy and comfort, and enhanced safety through making shorter braking distances possible on all road surfaces.



Scorpion Verde's eco-friendly profile reveals a tyre made entirely with materials free of aromatic oils, using 10 per cent fewer raw materials, decreasing its environmental impact per unit, and reducing mass. Yet the tyre's performance is in line with the best in its category.

For Pirelli, this simply reflects its industry leadership in improved performance and the minimising of environmental impact via production processes and products.

To celebrate the introduction of the Scorpion Verde, Pirelli Tyre offers you the chance to experience a specially assembled Pirelli Scorpion Mountain Bike imported directly from Italy. It's one of only a handful available globally – and can't be bought.

Rules:

1. Entry is open to anyone except employees (and their immediate families) of RamsayMedia, Pirelli and associated agencies.
2. Only one online entry per person. You may enter via SMS as many times as you like (SMS charged at R1).
3. Competition runs until 31 August 2011.
4. We will draw the winner(s) on 9 September 2011.
5. The prize is not redeemable for cash.
6. The judges' decision is final and no correspondence will be entered into.
7. Regrettably, only South African residents are eligible for prizes.
8. Prizes not claimed within 3 months will be forfeited.



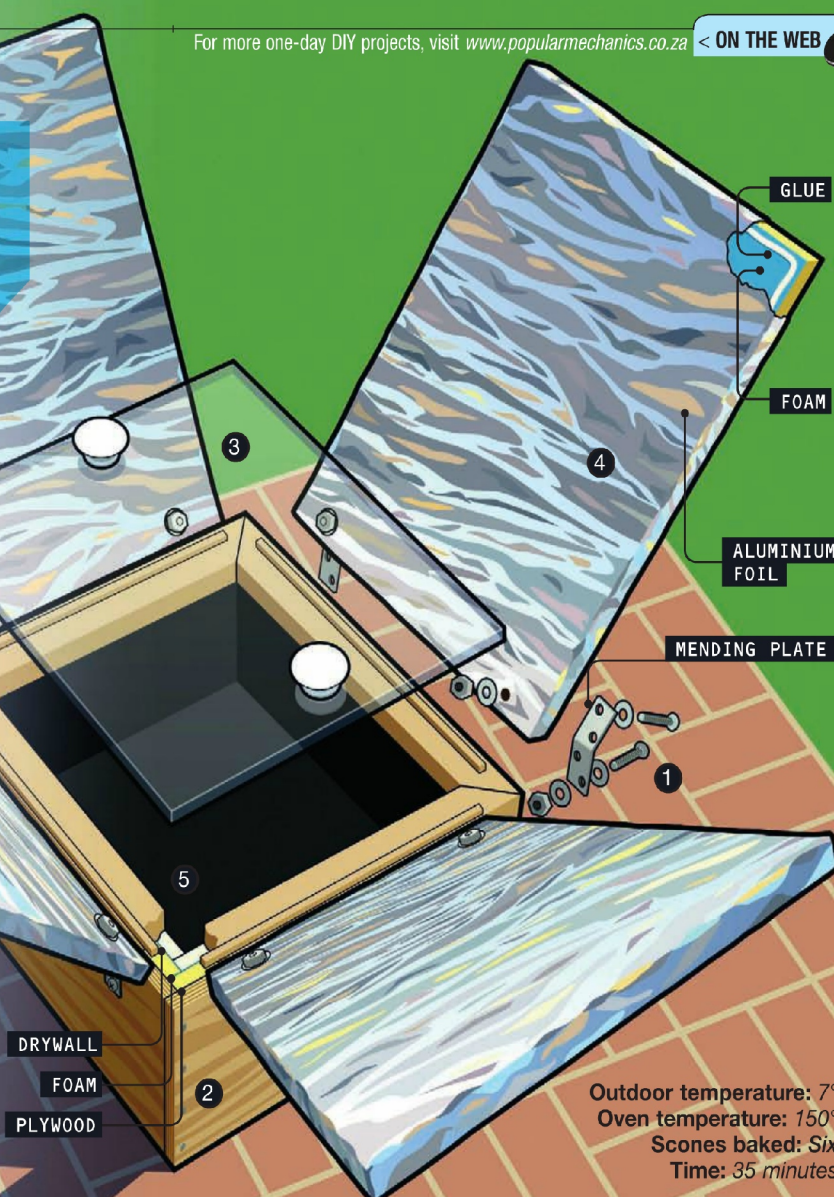
PM SATURDAY

ONE-DAY PROJECT

> BY WILLIAM GURSTELLE

Hot-box solar oven

No power? No problem. Bake off the grid with a sun-fuelled oven hot enough to raise some dough.



1 → FIND PARTS On a cool day, our solar oven got hot enough to bake a killer batch of scones – and in the summer, it can whip up brownies during load shedding. The project makes use of scraps (or full 1,2 m x 2,4 m sheets) of 20 mm and 12 mm plywood. It also requires 4d trim nails, a 2-metre length of 40 mm-wide flat wood trim, 90 cm of 6 mm-square moulding, a half-sheet of 12 mm rigid foam insulation, a half-sheet of 12 mm drywall, two white ceramic knobs, eight 75 mm mending plates, construction adhesive, high-temperature flat black spray paint, heavy-duty aluminium foil, No. 8 bolts, washers and nuts and a piece of 6 mm plate glass cut to 330 mm x 370 mm, with the edges sanded smooth.

2 → BUILD THE BOX Construct an open-top box using 20 mm plywood for a 355 x 395 mm bottom. Use 12 mm plywood to make four 180 mm-tall sides. With a vice and pliers, bend the mending plates to 135-degree angles. Fasten two plates to each box side with 25 mm No. 8 bolts, washers and nuts. Cut pieces of rigid foam insulation to line the box interior. Glue the foam to the plywood using construction adhesive. Cut and glue drywall panels to fit on top of the foam. Paint the interior black.

3 → PREP THE TOP Nail wood trim over the edges of the foam and drywall. Cut the moulding into four 230 mm lengths. Centre the glass pane over the opening. Put the mouldings around the

glass perimeter. Nail them down to steady the pane. Glue the knobs to the glass.

4 → MAKE REFLECTORS Cut rigid foam to four 300 mm x 600 mm panels. Wrap the foam in aluminium foil. Bolt the panels to the plates.

5 → BAKE IT UP Prep food in a black enamel pot with a lid; set the pot in the box. Replace the glass. Prop up the oven at an angle so the sun and reflectors shine directly on it. Use an oven thermometer to gauge heat. Note: this oven does not bake as quickly as a regular one (but our scones, with butter and berry jam, were still delicious). Wear oven mitts to handle the ceramic knobs – they get hot!

+ MORE TO DO IN AUGUST

Get snipping

After a long, bare winter, you want your garden to be bursting with life in spring. To ensure a good show of blooms when the temperatures start rising, don't forget that mid-July to early August is the time to prune your roses.

Make a move

Irritated by that shrub that always gets in the way? Worried about bushes that don't get enough sun? Potplants growing too big for their boots? With plants in a state of retarded growth, and less likely to be attacked by pests

or disease, now's the time to transplant.

Paint those walls

We're not joking: paint in winter. Depending on where you live, naturally: for instance, the highveld's dry winters are a perfect time to get your home into shape.

PM

HTC Flyer... a tablet that's out of this world!

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TOO BIG is just right

At Kumba iron ore's Sishen Mine, the default size is extra large. We size up some of their most extreme machines, and go for a ride

> BY ANTHONY DOMAN



Writer Doman returns to terra firma after a ride 9 metres up in the sky.

Perched in the cabin of a giant Komatsu mine hauler nearly 10 metres up in the sky, the outlook is stupendous. This tipper truck feels as wide as a bus is long, and as tall as a double-storey building. In the loadbox behind, you've got 400 tons of iron-rich rock. Under your right foot, 1 500-plus kilowatts with which to move it.

Nothing stands in your way.

Certainly not something the size of a Toyota Condor. The day the Condor inexplicably got in the way will live long in the memory of those involved. The mighty Komatsu shoved the minivan like a rag doll for all of 90 metres before the situation became... ah... apparent.

Several people were aboard the seriously mangled minivan. None was seriously hurt. What saved them was a simple safety device fitted to roadgoing vehicles around the world, but that had only recently been made mandatory on Kumba Iron Ore's Sishen mine: a bumper.

The massive beam – a handspan in

Check the air and oil – and while you're at it, hose off that pesky mine dust: haulers (Sishen is expanding the fleet to 129) line up at the workshop.

diameter – fixed low to the front end of the enormous mine haul trucks is actually a final failsafe: vehicles authorised to move around on to the mine now have to activate CAS (collision avoidance system) a radar set-up able to detect vehicles within a safe radius.

Maxi size, mini thirst

Considering their cost, it's a good thing these enormous machines are built to last... well, maybe not forever, but a lot longer than you'd think. One of the trucks used at Sishen has been in service for an astonishing 40 years. Current heavyweights stand 9 metres, weigh up to 600 tons, and work 24/7, lugging a payload that ranges from 300 to 400 tons.

All of that requires some serious power. Driving the air-conditioner unit alone requires as much output as the average city car engine's.

A typical powerplant is the MTU series 4000, a V12 with a capacity of 48,7 litres, producing a staggering 1 510 kW and 8 199 N.m of peak torque to drive individual electric wheel motors. Just like your turbodiesel car parked in the driveway, it runs a common-rail fuel-injection system managed by sophisticated electronic control, though the intercooled turbocharger is cranked up a bit higher at 3,2 bar.

And, like road vehicles, there's an increasing need to comply with ever-stricter emissions legislation. According to MTU, in future this type of engine will feature cooled exhaust gas recirculation (EGR), a two-stage turbocharging system and improved common rail fuel injection with increased injection pressure as well as a new Miller-cycle combustion process with modified valve timing.

Care and feeding

The cavernous workshops where these vehicles are tended are a sight to behold.





Far left: A hauler comes in for inspection.

Left: The air-con draws as much power as that produced by the average small car engine.

But away from all that sound and fury – not to mention all that clinging red iron-bearing dust and mud – an altogether more compact, finicky but vital operation takes place. Sishen boasts a tribology lab that wouldn't be out of place in an academic setting. It's become an important part of the mine's maintenance programme. What they're looking for is the wear metals, contaminants in lubricants' additive package. The relevant specification is 25 milligrams per litre, and they're aiming through preventive maintenance to restrict their readings to below 12 mg/litre.

Samples are taken constantly, and with expert analysis using methods such as infrared spectrometry (their most valued tools are the spectrometer and viscometer), the lab is able to build up a picture of what's going on inside engines before they break. In fact, purely by inspecting the lubricant, they are able to deduce what part of the engine is worn.

On top of the world

Then, the question I'd been waiting for all day: "Ready for a ride?"

Of course, that meant sitting in the usually unoccupied passenger seat. To be able to actually drive one of these things for a living, a driver's licence is only a starting point. An eight-week training course equips operators with the essentials for running their giant steed through the draining 12-hour shift that represents their working day. Of course, only the driver clocks out: the truck keeps at it, day in, day out, until it's reached its service interval.

With 30-year mine veteran Rico Aggenbag at the wheel, we set out in a hauler that had just come in for servicing.

It's an amazing feeling. If not quite on top of the world, you certainly feel on top of just about everything else around

you. The big diesel thunders away somewhere underneath and behind, and the moan of the drivetrain is overlaid by a turbocharger whistle, the whole snorting, rumbling soundtrack continually interrupted by the beep-beep-beep of the CAS, and the back-massaging vibes filtering up through the bodywork. There's nothing – nothing earthbound, at any rate – to touch it for that sense of sheer, immense power. But power can come at a cost.

"The important figure is the lowest possible cost per ton hauled," says MTU South Africa MD Michael Baumann. "It comes down to the tons per litre, and the single biggest cost component is fuel."

Well, there are ways around that. The mine haulers use a pantograph system

to connect to overhead powerlines on uphill. It boosts average speed from 14 km/h to 23 km/h – and cuts diesel consumption from 280 litres per hour to 40 litres per hour.

Sishen currently has 81 of these monsters, and plans to move up to 129 – some of them, we're told, too big to fit in the current workshop. Too big, after all, is just right...

From mariners to miners

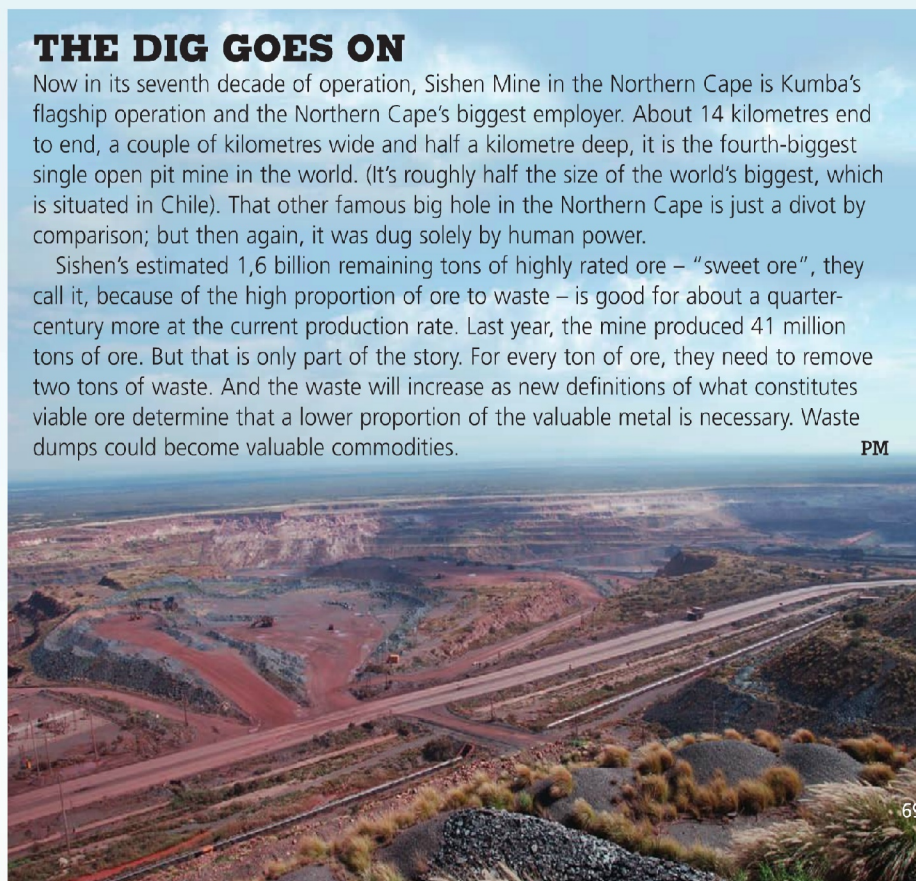
We were hosted on our mine visit by MTU South Africa, which supplies the big engines that drive mine haulers, gensets and the marine diesels that power most of our navy's vessels.

THE DIG GOES ON

Now in its seventh decade of operation, Sishen Mine in the Northern Cape is Kumba's flagship operation and the Northern Cape's biggest employer. About 14 kilometres end to end, a couple of kilometres wide and half a kilometre deep, it is the fourth-biggest single open pit mine in the world. (It's roughly half the size of the world's biggest, which is situated in Chile). That other famous big hole in the Northern Cape is just a divot by comparison; but then again, it was dug solely by human power.

Sishen's estimated 1,6 billion remaining tons of highly rated ore – "sweet ore", they call it, because of the high proportion of ore to waste – is good for about a quarter-century more at the current production rate. Last year, the mine produced 41 million tons of ore. But that is only part of the story. For every ton of ore, they need to remove two tons of waste. And the waste will increase as new definitions of what constitutes viable ore determine that a lower proportion of the valuable metal is necessary. Waste dumps could become valuable commodities.

PM



UPGRADE

New ideas that could change your world.

COMPILED BY THE EDITORS
popularmechanics@ramsaymedia.co.za



IT'S A BIRD, A PLANE...

Airbus Concept Cabin

Future aircraft could be built using a bionic structure that mimics the bone structure of birds, according to the gurus at Airbus, introducing their Concept Cabin at the recent Paris Air Show.

How so? As they tell it, bone is both light and strong because its porous interior carries tension only where necessary, leaving space elsewhere. By using bionic structures, the fuselage would have the strength it needs, but can also make the most of extra space where required. This not only reduces the aircraft's weight and fuel burn, but also makes it possible to add features such as oversized doors for easier boarding, and panoramic windows.

According to their vision of the future, the cabin's bionic structure would be coated with a biopolymer membrane that controls the amount of natural light, humidity and temperature, providing opacity or transparency on command and eliminating the need for windows. This smarter structure will make the aircraft lighter and more fuel-efficient while giving passengers 360-degree views of the skies.

Here's where it gets really gee-whiz. Says Airbus: "Materials that change shape and return to their initial form, growing like the leaves of a plant, are a very real possibility." They foresee sensor and activator systems that give materials a certain level of artificial intelligence, allowing them to adapt to passengers' needs. Smart solutions such as energy harvesting will be a part of the cabin

environment, with your seat or pod harvesting your body heat as you relax or sleep.

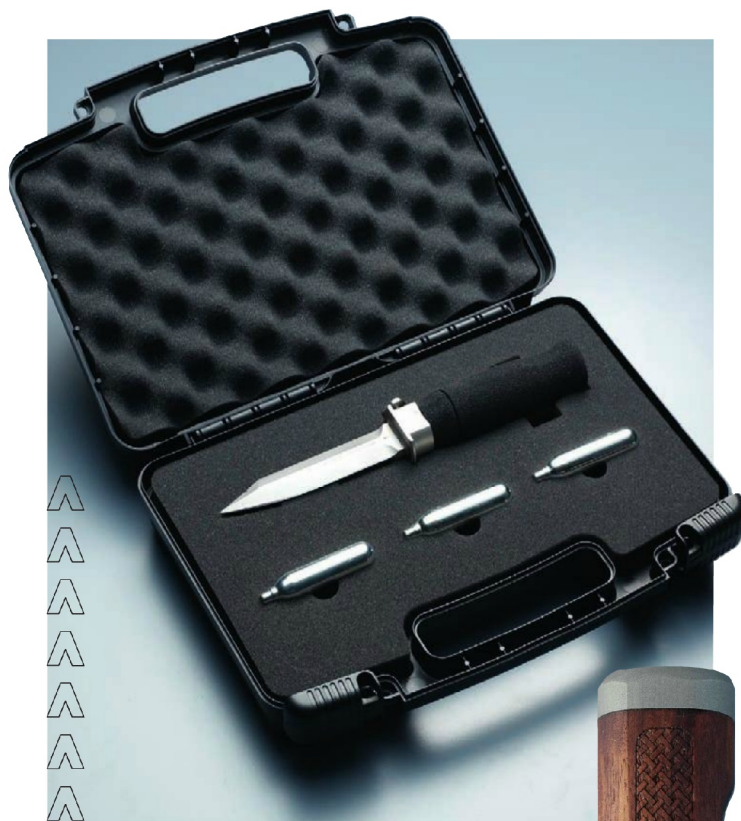
A private cabin can reflect your bedroom at home, a business conference or even a zen garden, thanks to the projection of virtual decors. Holographic technology will have advanced to such a degree that the virtual world will be indistinguishable from the real.



Airbus S.A.S



> Visit www.popularmechanics.co.za to discover the Airbus Concept Cabin – a whole new flying experience inspired by *Nature*.



TAKE THAT! BOOM!

WASP Injector Knife

When we first saw this item, our first reaction was one of mild shock. There's something indefinably sinister about a knife intended as a weapon, but when it's combined with an innovation that has the effect of an explosive slug, it becomes downright scary.

Anyway, enough agonising. Meet the WASP Injector Knife, a formidably effective weapon that injects a freezing burst of compressed gas into the er... *subject* through a tiny tube in the blade at a pressure of 55 bar. The result, according to the manufacturer, is devastating: it will "drop many of the world's largest land predators".

They add: "The compressed gas not only causes over-inflation during ascent when used underwater, but also freezes all tissues and organs surrounding the point of injection, on land or at sea. When used underwater, the injected gas carries the predator to the surface before blood is released into the water, thus giving the diver added protection by diverting other potential predators to the surface."

Somewhat disconcertingly, the knife is not intended solely for protection from ravenous Great Whites, marauding lions and similar predators. According to the manufacturer's Web site, it's also ideally suited to Special Ops soldiers, S.W.A.T. teams and security personnel such as air marshals. Oh, and for the record: "WASP Injection Systems, Inc does not condone the killing of innocent creatures."



VIDEO

> Visit www.popularmechanics.co.za to see the WASP Injection Knife take on a watermelon.



YES, BUT IT IS ART?

Forget logic. It's cool

It started out a few years ago as an offbeat honours project at the University of Adelaide, Australia, and has since evolved into something rather special (that is, in the arcane field of human-operated diwheels). Not surprisingly, we love it.

In essence, it's an electric-powered diwheel with quite a bit of functionality absent in similar machines, such as built-in dynamic lateral stability and slosh control to prevent "gerbiling" or tumbling during aggressive braking or acceleration manoeuvres. Keeping the vehicle in its unstable state is achieved using a combined swing-up and inversion controller. It also incorporates a unique feature that allows the rider to drive upside down. Top speed is around 40 km/h, and the diwheel is said to climb a maximum incline of 12 degrees. The sealed lead-acid batteries provide an operating time of about 1 hour.

What's it for? That's a ridiculous question. You should be ashamed.

PM



VIDEO

> Visit www.popularmechanics.co.za to see EDWARD, a human-operated di-wheel, being tested.

HONDA

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In a symphony of safety, technology and dazzling design, the new Honda Accord presents the latest in advanced Honda engineering, while boasting a 5 star Euro NCAP rating across the entire Accord range. With ADAS technology which includes Lane Keeping Assist System (LKAS), Adaptive Cruise Control (ACC) and Collision Mitigation Brake System (CMBS)^{*}, the Honda Accord Exclusive is the true fusion of brains and beauty.



www.honda.co.za

^{*}Honda has been awarded one of the first Euro NCAP Advanced Awards for its CMBS technology.

Accord



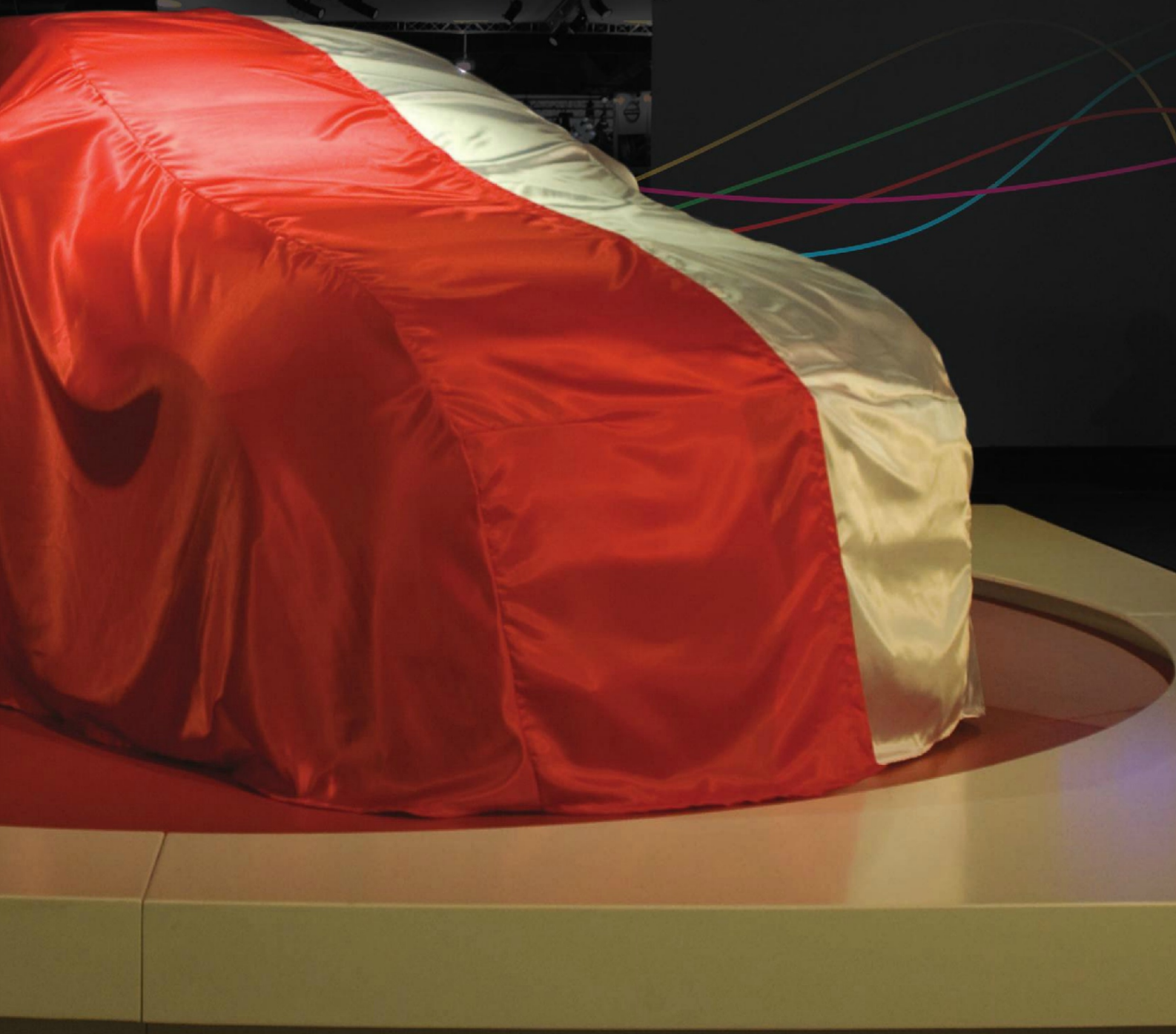
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Headlines from around the automotive world >>>

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REFINED ON THE RACE TRACK

MASERATI GRANTURISMO MC STRADALE

The first Maserati to have a dedicated "Race" mode, the GranTurismo MC Stradale draws on the company's Trofeo GranTurismo MC motorsport programme. Incidentally, Race mode not only juices up performances – it adds a sizzle to the car's sound. (In Sport mode, an exhaust bypass valve opens at 4 000 r/min; in Race mode, this is permanently open.) It's also the first Maserati to have Brembo Carbon Ceramic Brakes as standard, and the first to use advanced electronics to cut gearshift times down to 60 milliseconds.

The 4,7-litre V8 engine develops 20 N.m more than before, with a peak of 510 N.m and a power peak of 336 kW at 7 000 r/min.

Top speed is over 300 km/h. And price is, as you'd expect, on application.

Competitive edge

The force. According to Maserati, its experience of racing and computational fluid dynamics has helped it tweak the car's "aerodynamic envelope" to increase downforce 25 per cent in front and 50 per cent at the rear compared with the GranTurismo S model. The front spoiler, side miniskirts and slots in the front wings combine to push the front of the car down at high speeds, cool the brakes, extract hot air from the brake circuits and deliver downforce to the entire car. The miniskirts have been designed to integrate with the vents to channel airflow under the car body, further increasing downforce. Two slots on the bonnet cool the engine compartment. At the rear, a bumper redesign features centrally located exhausts and a profile that helps extract underbody airflow. The rear spoiler completes the downforce package.





PLUG IN, FILL UP **TOYOTA CHARGER FOR EVS AND PHVS**

Although established electric vehicle manufacturer Th!nk was in financial trouble for the fourth time in its existence at midyear, the big guns are forging ahead in their quest for alternative automotive energy sources. This month, a smart charging system for electric vehicles and plug-in hybrids was due to go on sale to dealers in Japan.

Toyota's model 200 G-Station charger features contactless smart-card recognition. The technology was co-developed by Toyota Motor Corporation (TMC) and TMC's customer-service IT company Toyota Media Service. It's able to connect via the Internet with the Toyota Smart Centre, which uses a global cloud platform recently announced as a co-development project with Microsoft Corporation.

The relevance of the Microsoft tie-up and the cloud connection becomes obvious with the announcement that users will be able to receive e-mail updates of charging status. They will also be able to check location and availability of chargers by means of a mobile phone.

Smart card verification will make provision for charger operators to gain access to user history, carry out billing and award points according to use time. It will also allow remote monitoring and the administrator can attach supplementary information to the G-station



location information it sends.

In addition, the location of chargers can be displayed and set as a destination on G-BOOK2 compatible navigation systems and Smart G-BOOK, an information service for smartphones. What's interesting for the wider world out there is that this is not a closed system: information from the Toyota Smart Centre about charger location and availability will be in an open format – meaning that it may be displayed on maps on the Internet and on navigation systems produced by other manufacturers.

G-Station is said to be compatible with the proposed Japanese EV and PHV charging methods and usable with both Toyota and non-Toyota vehicles. It will be sold in two versions: Type A (standard) and Type B (advanced). Type A, priced at about R24 000 for the main unit, will be the industry's most affordably priced charger with a telecommunications function.

Besides selling G-Station to its dealers, Toyota also plans to branch out to shopping malls and family-style restaurants. They're predicting cumulative sales of around 3 000 G-Station units by the end of 2012.



Recharging Toyota's Prius PHV

THE SPACE RACE

2011 RENAULT SANDERO

We may not be able to give you glamour or cachet, we may not have the best reputation, but we can offer you features! Value for money! Space!

It's weird hearing that kind of talk emerging from the Euro camp. Wasn't features the differentiator that the south-east-Asian makes fell back on? No more, it seems. The French makes – Renault in particular – have taken a pounding in the marketplace because of iffy service, high service costs and poor resale.

Renault's response has been an ongoing product offensive, swingeing price cuts and an organisational shake-up. Latest instalment: a streamlined Sandero range that features a new entry-level model to take the fight to the sub-R120 000 bracket.

We renewed our acquaintance with the Sandero on a short urban route that confirmed its core qualities of cheerfulness, cheapness (well, that's relative), comfortable ride, and generally solid feel. The steering isn't the last word in responsiveness and precision, and the plasticky interior won't win any Good House-keeping awards, but there are distinct positives in areas such as safety and space. Prices: R104 900 (1,4), R124 900 (1,6) and R149 900 (1,6 Stepway).

Competitive edge

Do the math. Always a matter of perception, but there's no denying that, at R104 900, the Sandero 1,4 Ambiance offers a compelling package when compared with the opposition both above and below it in price. Optional service plan, at R3 800, and radio, at R1 900, diminish the advantage somewhat, but ABS brakes and dual airbags, 5-year/150 000 km mechanical warranty plus roadside assistance balance that out. The cost of the Sandero 1,4's parts basket (measured in the 2010 Kinsey Report), which includes service parts, repair parts and crash parts, represents just 29,15 per cent of the car's retail price and tops the sub-R120 000 category.

Hear the echo. Although it competes in the econobox area of the market, the Sandero boasts generous interior and exterior dimensions. Its boot, at 352 dm³, is best in class.

GODZILLA GETS FIERCER

2012 NISSAN GT-R

Nissan's GT-R didn't earn its Godzilla nickname for qualities that would suit a Lexus; this relentless tarmac eater would never let such niceties as chassis refinements or sound deadening impede its epic performance goals. But the 2012 GT-R's updates include suspension tweaks that reduce understeer, increase feedback and all for more balanced handling, as we discovered the four-seater through several hundred kilometres. Lest you suspect Nissan's flagship has lost its edgy output to a tyre-spinning 395 kilowatts while managing a moderate improvement in economy. The spring to 100 km/h now arrives in a scant 3,2 seconds, which trumps Porsche's 911 Turbo. Godzilla's ride is still bone-shaking, and its automated dual-clutch six-speed transmission groans and clunks

like a rusty barn door, but this bad boy's speed-hungry target audience wouldn't have things any other way. – BASEM WASEF



STICKS LIKE CRAZY VW SCIROCCO R

My driving companion used the world "planted" to describe how it feels to be piloting VW's Scirocco R on a twisty back road. I have to agree. In standard trim, the slinky coupé is a bracing drive. With the extra horses and sports chassis that come as part of the R package, it's simply breathtaking. The penalty for this kind of outright sportiness often is an unrelenting ride over anything other than billiard-table blacktop. Not so with the R; even on the Sports setting of the optional Dynamic Chassis Control setup fitted to our test drive cars the ride was racy without being harsh. The 2-litre turbo Four is a gem, too. Its lively nature and boundless urge seems perfectly balanced with the car's agile handling, wonderfully precise steering and tenacious grip.

Performance: 0-100 6,0 sec (manual), top speed 250, combined economy 8,1 litres/100 km, CO₂ 189 g/km. Price: Manual R403 355, DSG R417 855.

Competitive edge

The power. A 2,0-litre, four-cylinder designated EA113 drives the front wheels. Reinforced cylinder block incorporates new-design head, uprated pistons and conrods, and

high-pressure injectors. Uprated turbo-charger generates 1,2 bar of boost – and lots more heat, necessitating an uprated intercooler as well. Result: 188 kW and 350 N.m.

The control. Dynamic Chassis Control's normal, comfort and sport settings adjust suspension, steering and accelerator response characteristics. Each of the four electrically adjustable dampers operates according to a map of characteristics linked via a control module to the car's CAN (controller-area network) data systems. A battery of sensors measures wheel displacement and body structure movements feeds into the control mechanism. Normal mode provides a balanced blend of ride, steering and throttle response; in Sport mode the map changes to reduce steering assistance, stiffen damping and sharpen throttle responses; and in Comfort the settings go to the other extreme, with greater steering assist and ride comfort. Wheels are 19-inches wearing 235/35 tyres.

The grip. XDS, an electronic cross-axle traction control system, extends the electronic limited slip differential (EDL) that forms part of the car's standard stability program. Combining inputs from g sensors (lateral forces) and ABS sensors (friction) the system can counteract loss of traction on the car's inside wheel while cornering by automatically applying a braking force to that wheel, effectively increasing traction on the opposite front wheel. The XDS difference: it predicts traction loss, rather than reacting to it, for more neutral, controlled responses – and less understeer.



BACK ON THE BLOCK

2011 HONDA CBR600F

It's been nearly a quarter-century since Honda put a bike on the road bearing the CBR600F badge. Well, it's back.

Unlike the distinctly more focused CBR600RR, says Honda, the CBR600F has been specifically developed to deliver neutral handling and near-Supersport levels of performance, as well as refinement and practicality.

In other words, it's a more practical high-performance bike for the road. To indicate just how practical, consider this: service intervals are doubled from 6 000 to 12 000 km.

The 600F's 599 cm³ liquid-cooled 4-stroke 16-valve DOHC develops 75 kW at 12 000 r/min and 64 N.m at 10 500 r/min. Price: R84 999.

Competitive edge

Practical design. Sculpting of the surrounding bodywork allows the 800 mm seat height to be comfortable for a wide range of riders, and handlebars are set higher to take weight off the wrists for better comfort and control. Comfort extends to the passenger as well, with a big, deeply padded pillion seat that's also low-set and close to the rider. Special recesses on the underside of the tail unit provide handholds.

Racy, but refined. Developed alongside the 2007 CBR600RR's power unit, the F's DOHC Four is tuned for a broad spread of power and torque. Advanced PGM-FI electronic fuel injection system plays an important role, as does a 4-2-1 exhaust system with catalytic converter.

A delicate balance. The compact, light engine/chassis package meant that Honda could combine the dual requirements of long swingarm for sure-footed handling with a short (1 435 mm) wheelbase for agility. The advanced front suspension uses 41 mm inverted HMAS cartridge-type forks. Compared with the CBR600RR, compression damping is decreased for better bump absorption; while the tension damping is increased for enhanced control of weight. Spring preload and tension damping adjusters allow tailoring of the suspension behaviour front and rear.



TWO-WHEELERS CHARGE UP

2011 ZERO BIKES

Zero's 2011 line-up – now five bikes strong – reveals how rapidly the electric-motorcycle field is maturing. Nearly completely redesigned for 2011, these lithium-ion-battery-powered bikers feature increased range and a quick-charger that can top off the battery in about two hours. The slight, 135-kilogram kerb weight of the dual-purpose DS model makes it extremely flickable, while new steel-braided brake lines and a bigger front rotor offer more feel and stopping power. Above 50 km/h, it whisks itself effortlessly through space while emitting only a slight motor whine. But range is still the DS's *bête noire*: we ran only 70 kilometres before the battery went flat. – BASEM WASEF PM

Aluminium frame

2011 Zero DS



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Audi, BMW, Jaguar and Mercedes-Benz are just some of the luxury European car manufacturers that specify Dunlop tyres as original equipment on selected models.

[FEATURE]

Ka

Team America lets 'em fly at L'International des Feux Loto-Québec in Montreal last July.



boom!

EVERY YEAR, THE WORLD'S TOP FIREWORKS COMPANIES TRY TO OUTBLAST ONE ANOTHER IN MONTREAL. THIS TIME, THE US TEAM AIMS TO WIN WITH ARTISTRY, PRECISION AND HANDMADE SHELLS.

> BY CHRISTOPHER MAAG > PICTURES BY LEON CHEW

Two bombs lift into the sky. They rise for precisely 6,5 seconds, streaming fire like comet tails. The explosions hit simultaneously, releasing bolts of white and then showers the hue of burning embers.

More fireworks blink on – a series of orange and white flares strung together to outline a ship. Céline Dion's voice steals over the crowd: "Every night in my dreams, I see you, I feel you." As people realise the ship is the *Titanic*, they begin to scream. The song builds. Fireworks fill the sky, the bombs and notes bursting at precisely the same time.

"Ah! Ça, c'est beau!" yells Ronny Boghen, one of 300 000 spectators watching a Canadian tribute at the 2010 L'International des Feux Loto-Québec, an international fireworks competition in Montreal. "They always do something that surprises!"

Meanwhile, 2 700 km away in Carrier, Oklahoma, Gary Caimano presses *Start* on the photocopier in his office. The machine thumps out another copy of his plan for the competition. Caimano runs a metal ruler over the pages, checking every cue.

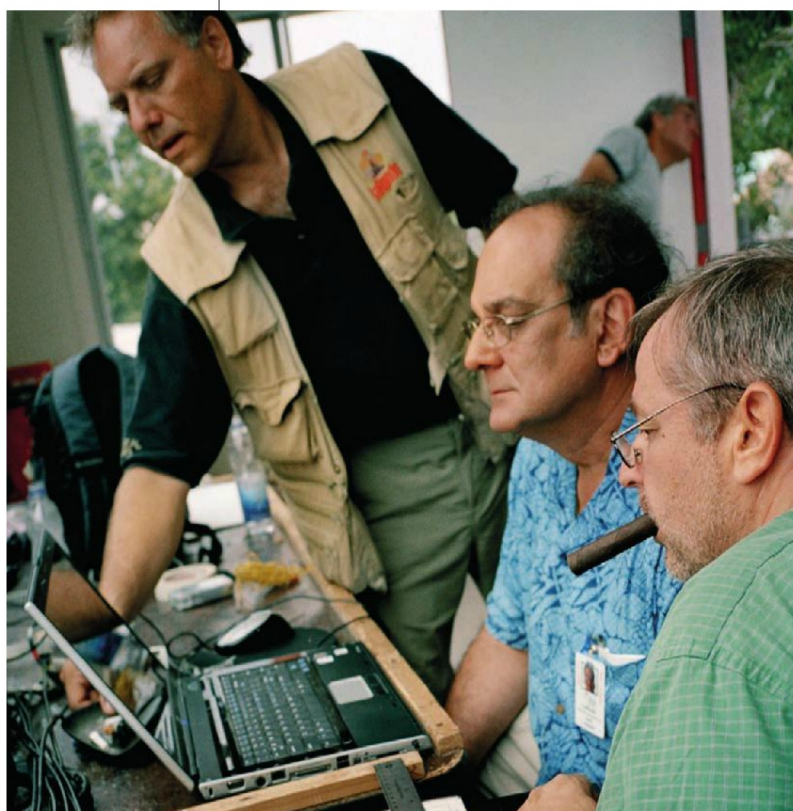
He hasn't slept a full night in months; years of stress and cigarettes have stained his cheeks and eyelids purple. In a few hours, Caimano will leave for Montreal, where his tiny company will represent the United States against bigger outfits from seven other nations; most, like those from Italy and France, have competed there multiple times.

The US has claimed eight gold medals since the competition began in 1985, twice as many as any other nation. But this year, the Americans are underdogs. Not that Caimano is intimidated. "Oh, we're gonna bring the rain," he says, laughing. "We're gonna make the sky move."

Every summer, the top fireworks companies in the world meet at La Ronde, an amusement park on an island in the St Lawrence River, where they have R490 000 and five days to load thousands of aerial explosives for sophisticated pyrotechnic shows synchronised to music. If a regular Fourth of July display is like a squirt-gun fight, a performance here is like a battle of water cannons. "Everybody's trying to push the best fireworks and the newest launch technology to the absolute limit," Caimano says.

La Ronde's stage invites such brinksmanship. The audience sits on a grandstand beside a man-made lake. Before them lie five firing positions called ramps. (Most big shows have one or two.) Three football fields away, hundreds of 20 cm bombs can launch simultaneously from five concrete bunkers at Ramp 1. Few fireworks sites are this big – or this intimate. Shells also shoot from floating pontoons only 80 m from the stands. "We can do things here that no one has ever seen before," says Denis Lono, who co-ordinated the 2010 jury.

Crowds in Montreal prefer shows that start with a wallop nearly as big as the finale. From there, most designers splice together snippets from dozens of songs, packing the soundtrack full of "punch posts" where they can let the large artillery fly. This year's biggest opening sequence came from Macedo's



Top: Western Enterprises designer and choreographer Gary Caimano (centre) with the competition's technical director, Paul Csukassy (left) and PyroMaster consultant Jamie Deye. **Bottom:** The PyroSeeking Firing System in the control room at La Ronde.

Pirotecnia, a Portuguese company that launched a barrage of shells that turned the entire sky red for the first 20 seconds.

Sweden's team punched in with ABBA's "Dancing Queen" and fireworks resembling a 300 m-tall Wurlitzer jukebox. Poland's Surex Fireworks launched blue fireworks from the pontoons; they skipped across the lake, reflecting off the surface as if it were a mirror. The French team, Brézac Artifices, used white and blue flares to create the illusion of a monument rising from the lake.

Canadian blogger Paul Marriott has reviewed 169 shows on his Web site, which is devoted entirely to the competition. "A fireworks show should be like a good rollercoaster – there should be moments of building tension, climax and quiet," he says. "That said, there is a trend toward more and more firepower."

Western enterprises is one of the last US companies still making its own fireworks. They are beautiful, with tricky colours such as dark cherry and pistachio

THE SCIENCE OF FIREWORKS

Each explosion in a fireworks display begins with a shell. Inside, “stars” filled with chemical compounds surround a core of black powder. After a shell launches, a fuse sparks the powder, firing stars in all directions. The stars ignite, setting off chemical reactions that create various effects. “Everything you see in a fireworks show is chemistry in action,” says John Conkling, a pyrotechnic chemist at Washington College in Maryland. – Sarah Fecht



1 RED HEARTS

COLOUR:

Strontium compounds; burning them doesn't produce by-products that weaken red like other colours.

EFFECT: To get novel shapes, stars are glued to paper in the desired pattern and surround the shell's black powder. The hard part, Conkling says, is getting the shell to burst when it's oriented correctly, preventing upside-down hearts or backward letters.

4 GOLDEN DRAGON EGGS

COLOUR: Sodium compounds; the use of gold in fireworks dates from the Renaissance.

EFFECT: Dragon eggs are created with a bismuth metal compound, copper oxide and a magnesium-aluminium alloy. The mixture reacts very energetically, snapping against the surrounding atmosphere. “The air gets pushed back so quickly that it's breaking the sound barrier, which produces audible crackling,” Conkling says.

2 GREEN WILLOWS

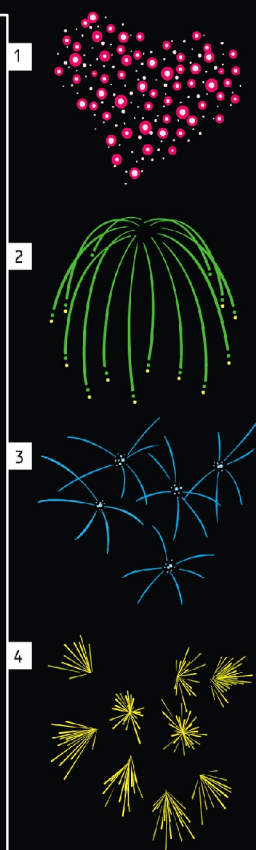
COLOUR: Barium compounds; their chemical stability makes them easy to work with.

EFFECT: Pyrotechnicians create long-lasting sparklers by substituting charcoal for stars' metal fuels. Charcoal makes the barium burn slowly, creating the draping effect of the willow as the stars fall. For symmetry, stars must weigh nearly the same and be distributed evenly throughout the shell.

3 BLUE CROSSETTES

COLOUR: Copper compounds; they have to burn at lower temperatures to remain stable, so blue light is less intense and more difficult to produce.

EFFECT: Each crossette shell contains paper-wrapped stars packed close to a black powder core. When the shell explodes, the primed end of each star ignites and burns toward its centre, which contains a separate charge. That splits the star into burning fragments.



green, and names like Aqua Coconut Trees and Colour-Changing Brocades. It's also one of the few specialising in close-proximity shells and effects, which explode so low to the ground that the audience feels like it's in the middle of the show.

Because they're hand-made, Western's shells cost four to five times as much as those manufactured in China. So while some competitors use the R490 000 to bulk up on cheap firepower, the budget at La Ronde won't go nearly as far for Western.

“Good God, the Chinese stuff comes in so cheap, you can hardly compete,” says Alan Johnson, Western's consulting chemist. “Companies come in here and bring the beef and try to blow everybody out of the water with just sheer power.”

Caimano has always preferred to strive for artistry – matching the rhythm of fireworks to the pulse of music and cadence of poetry. He was born into one of America's oldest fireworks families, the Zambellis, and grew up learning the craft from his uncles after a shell killed his father, when Caimano was five. “I think we all have this primal love for fire,” he says. “It got into my blood before I even knew it.”

With Pyro Spectaculars in California, Caimano co-produced shows for two summer Olympics. For nearly a decade, he designed Macy's Fourth of July display in New York City. He lived in San Bernardino, made

good money. Then Jim Burnett, Western Enterprises' owner, offered something Caimano had long wanted: creative control, plus a factory capable of making any effect he dreamed up.

In 1998, Caimano moved his wife and kids to Carrier, population 78. “I'm surrounded by explosives every day,” he says. “It's magical.”

Instead of stitching together punch posts with a musical medley at La Ronde, Caimano will play 12 entire songs, letting the emotional rise and fall of each one carry the show. “I've always believed in subtlety,” he says. “My idea is to do as much as I can with as little as I can use.”

Western's show might look great. Or it might seem like a skinny teenager swimming around in his father's shirt. “Gary's show is very clever,” blogger Marriott says. “Maybe too clever.”

A truck delivers Western's shells three days before showtime. Burnett, who's 62, pulls on gloves and starts dropping shells into mortars in the noontime heat. La Ronde's fireworks and entertainment technical director, Paul Csukassy, works alongside the best fireworks teams in the world. “These guys are different,” he says. “They're really passionate.”

It's the day before the show, and Caimano is one second late. He's been one second late for three hours. Now all of his cigarette smoking and pacing

have come down to this moment. He's standing clenched and still, glaring at a metal box. "I'm trying to stay patient," Caimano says, "but I'm about to lose my cool."

The box is a brand-new, Chinese-made computer called PyroSeeking. Switching firing computers at the last minute is a big risk, one that most technicians would never take. But Caimano needs to launch every shell from multiple sites exactly on time, so he's gambled on the most advanced model he could rent.

PyroSeeking should be a safe bet: it is so precise that it times each bomb's ignition to 1/100 of a second. Unfortunately, the computer keeps firing cues precisely one second after the beat. "This is why you don't do something new at the last minute," Csukassy says. "You do what works."

Outside the control room, the crew loading shells bogs down in the heat. Gilberto Mora, who works in the factory at Western, wipes his forehead with the sleeve of his T-shirt – made from cotton, so that it can't produce a spark. Before long, thunder rumbles, and everyone looks up. Then the sky opens. Mora sprints for cover. Rain can short the computer's firing systems. Also, the close-proximity shells – currently covered with plastic – are packed in cardboard tubes; if they get wet, they won't light.

"It's a torrent! A literal torrent!" Burnett says, wiping the rain off his face with his open palm as he steps into the trailer. "Golly. What a mess."

Meanwhile, Caimano finally knows why PyroSeeking is late. Instead of beginning the count at one, like European machines, the Chinese computer starts at zero. Jamie Deye, who runs the firing system, compensates by moving the entire soundtrack back by one second. "It's on the mark! Just burn the damn thing (on a CD) right now!" Caimano yells.

Csukassy shakes his head and snorts a laugh. "Tomorrow should be a good day," he says. "Except maybe the weather."

On the ride back to La Ronde the following afternoon, the sky is black with rain. Caimano, Burnett and the rest of the Western team glumly watch the water pour down the van windows. Finally, it lets up. The Americans run through a back gate and into the amusement park. The local crew reports that the ramps took a direct lightning strike, maybe two. Nobody knows how many fireworks were lost.

Thirty minutes before showtime, people begin pouring into the grandstands. Csukassy walks over to Caimano with a walkie-talkie. It's decision time: remove the plastic? The big aerial fireworks can shoot through it – but not the close-proximity shells, which make up two-fifths of Western's show. To fill this enormous canvas, to win, Caimano needs those fireworks. But exposing them will leave Western's beautiful shells vulnerable should the rain return.



A pyrotechnic crew loads shells into mortars at Montreal's La Ronde amusement park, the site of an international fireworks competition.

At the last possible moment, he gives the order: remove the plastic. Breathing loudly, Caimano climbs the stairs behind the grandstand and enters the control room. Over the speakers, the announcer counts down in French.

"Somewhere... a place for us," Barbra Streisand sings, and the computer fires 10 purple comets with golden tails that rise and swish. The sound builds into a wall of bass, Streisand's voice soars, and the whole sky explodes. White close-proximity shells *foosh!* from the ground, then turn green. In that split second before Streisand pops the "p" on "place for us", two big aeriels burst high and bathe the audience in mint-green light. People in the grandstand smile and *whooo!*

Caimano's got them. He stands in the open window and wipes sweat from his face with a wet towel. A rain-drop hits his forehead. And another. Soon it becomes a drizzle. Then a downpour.

The misfire starts small: a few green and red strobes on Ramp 3 scream sideways. Before long, one-tenth of the fireworks on Ramp 2 are underwater. Nearly 200 shells can't fire.

The Americans will not win this competition. Caimano knows that. But he may have enough fireworks left to put on one hell of a show.

Roger Daltrey belts "Love, Reign O'er Me", The Who's great power ballad. Little shells burst to create the shapes of hearts. Then the computer launches everything it's got. Blue shells stretch over the lake, clawing at the crowds. A white tower rises into the sky and connects to a hammering mass of blue and red stars before it all morphs into a thundering mushroom cloud.

The boom of exploding shells recedes. The rain is gone. As the crowd stands to cheer, Caimano looks around and smiles. "What did I tell ya?" he yells. "I said we were gonna make the sky move!"

PM

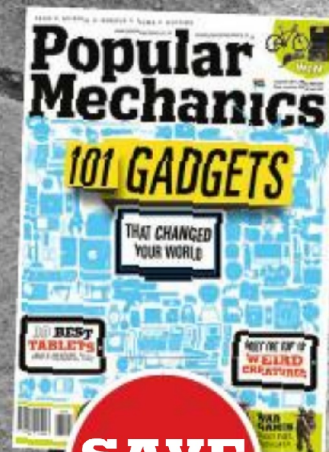
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Timeless Cord

> BY JAY LENO

> PICTURES BY
JOHN LAMM

This year marks the 75th anniversary of the Cord 810/812. It was a sensation when it went on sale in 1936, and I think it's still one of the most beautiful sedans ever built. Originally intended as a "baby" Duesenberg, it was packed with advanced features such as front-wheel drive; independent front suspension; a unitised body; an "alligator" bonnet hinged at the rear (like most of today's cars); a 93 kW, 4.7-litre V8 engine with aluminium heads built by the Cord-owned Lycoming aircraft engine company – and a four-speed Bendix preselector gearbox with vacuum/electric shifting.

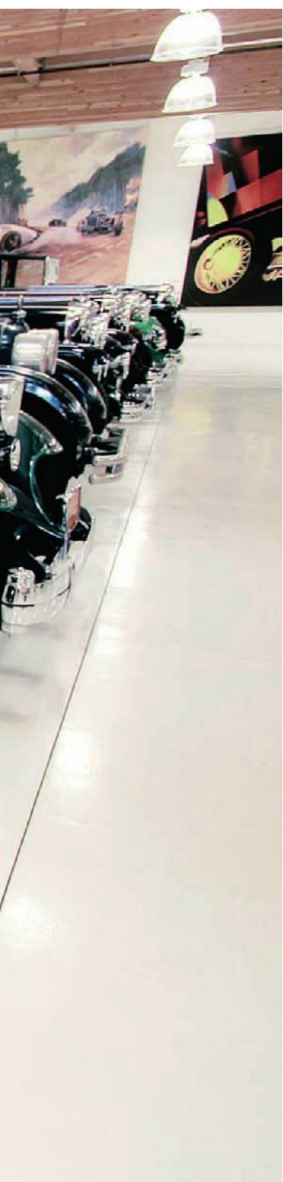
It had three other features that were

firsts in America: the hooter ring and, for improved streamlining, a covered fuel cap and hidden headlights that the driver unveiled with a hand crank. For the 1937 model year, there was an optional centrifugal supercharger, good for 145 kW.

Naturally, the car was a failure.

Cord didn't have the time or the money to test and tweak all these innovative systems before it went into production. Back in the day, that wasn't uncommon, as anyone who owns an English car from the '40s or '50s can tell you. The guy at the factory would say, "You're the test driver. If you have any problems, let us know!"

That's how the Cord quickly developed



VIDEO

> Take a closer look at Jay's 1937 Cord 812 on www.popularmechanics.co.za

Left and above: The 1937 Cord 812 was an early adopter of front-wheel drive and hidden headlights, but reliability problems kept this stylish car from sales success.

a reputation for being gorgeous but unreliable. It overheated. If you left it in gear and you lost the vacuum, the transmission wouldn't shift. Most mechanics couldn't work on the car – it was complicated and unlike any other they had ever seen. If the

engineers had had time for quality control and getting the bugs out, I think the Cord would have been a bigger hit.

The price tag was also an issue. At around \$3 000, the Cord cost as much as a Cadillac, but it was way smaller. People who spent that sort of money wanted a larger car. The concept of a small personal luxury car was still 20 years away. The Ford Thunderbird was the first of those "Ooohhh, this is kinda cool, lookit this," kinds of cars.

One of the things I admire about the Cord is that the stylists and the engineers used a lot of ingenuity. They had to. The Cord was designed and built on a shoe-string budget in the middle of the Depression. Here's one example: everyone admires the Cord's wheels and hubcaps as pinnacles of art deco styling. But the

simple, elegant look was a pragmatic solution to a problem. During a cross-country test drive, the brakes overheated. There was no money to develop better brakes, so the engineers later drilled holes in the full-size hubcaps to cool the brakes, and those hubcaps became one of the Cord's most admired styling elements.

The Cord factory made just under 3 000 cars before production ended in August 1937; about two-thirds survive. When I was looking for a Cord, I contacted the Auburn-Cord-Duesenberg Club. I always pay a little too much, but I wind up with a car that someone has put his heart and soul into. Mine was restored by a skilled New Jersey man named Arthur Pirre. He was an excellent mechanic and a machinist – a perfectionist. Sadly, we don't have many men like him today. He worked on this car until everything was perfect, but hardly ever drove it. His joy was making it work.

I run my Cord with radial tyres, and it steers and corners beautifully. The Cord is one of the best-handling cars of the '30s. In fact, it's better than most cars of the '40s and '50s. The four-speed Bendix preselector gearbox is extremely easy to use. Introduced in the early 1930s, on the Hudson and Terraplane, it was called the Electric Hand. Fourth gear is an overdrive.

In Europe, companies like Wilson and Cotal made preselector boxes for sport and luxury cars.

The transmission in my car shifts wonderfully. Using a little lever on the steering column, you select a gear, step on the clutch, and bingo! The next gear is automatically engaged. You don't have to take your hands off the wheel in a fast turn. In most cars from the '30s, you have a long stick shift that comes out from under the dash. With front-wheel drive, there's a flat floor and all sorts of room in front. Interestingly, in 1947, Preston Tucker initially used salvaged Cord gear-boxes before his engineers built a similar transmission of their own.

Under the bonnet, the Cord's engine compartment is crowded compared with others of its era. Packing in the Schwitzer-Cummins supercharger made everything more complex. GM had stylists who designed engine compartments so that, when you opened the bonnet on a Cadillac, you saw that beautiful V16 and everything laid out for easy access, with no exposed wiring. Not this car.

It doesn't take much to scare people away from a certain make. We're on the cusp of Fiat returning to America. But if those first 1 000 cars aren't perfect, you'll start hearing all the old "Fix It Again, Tony" stories. Touted as a car of the future, the Cord was a styling tour de force. But its special features weren't fully developed and tested, and rival salesmen were waiting to exploit any flaw.

It's like steam cars; a steam car has never blown up. Yet internal-combustion boosters insisted: "Oh, forget steam cars; they'll blow up." So salesmen trying to move the Cord had that bad reputation to deal with. And some rumours of problems turned out to be true.

As a classic car, my Cord is flawless. But as a car you'd use every day, I can see where you'd have some problems. You're not going to take a classic car out on a hot day; you can't leave it in gear; you only drive it under ideal conditions. In the same way, the Lamborghini Miura isn't a great driving car, especially over 100 miles per hour, when aerodynamic forces make the car light and affect the handling. With a classic car, all those flaws are exciting – just not on a day-to-day basis.

PM

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ONSCREEN 3D VIEWING

Making movies 3D

Stereoscopic video cameras are available and surprisingly affordable. What does it take to create your own 3D Epic?

> BY JOHN HERRMAN



EDITING



3D TV

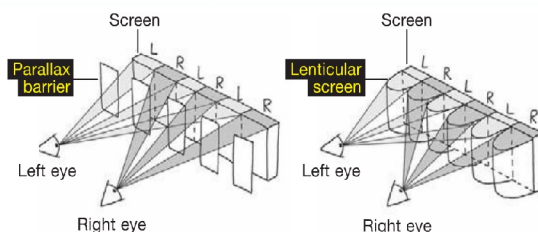
ANAGLYPH 3D
ON PC

➔ Should everything be in 3D?

Electronics companies sure think so. Over the past three years, 3D-capable computers and Blu-ray players and HDTVs with stereoscopic screens have been pitched to consumers. It's a formula that has proved profitable in theatres – for many blockbuster films, moviegoers have gladly plunked down a few extra bucks and donned a pair of glasses in exchange for a jaw-dropping spectacle. When it comes to investing in expensive new gear to bring that experience into the living room, however, most viewers have been hesitant.

But there's one category of 3D gear

GLASSES-FREE 3D ➔ There are two technologies used for autostereoscopic screens. Lenticular screens use a layer of miniature lenses, or lenticules, to refract light from different pixels to the left and right eyes. Parallax barrier screens use a layer above the screen with precisely positioned slits that allow each eye to see only certain pixels. The technology is also used in vehicle displays to send separate content to the driver and the front passenger.



for the home that doesn't require a bank loan: 3D video cameras. I'm not talking about James Cameron's Pace camera rigs here; these are ordinary consumer-grade camcorders that are affordable and as easy to use as run-of-the-mill video cameras. They are a surprisingly accessible first step into 3D video. Sure, you'd ideally have a big 3D TV and glasses to watch your creations, but they're not strictly necessary. You can see the video – in 3D and without glasses – on the cameras' own displays.

It's no accident that some of these cameras' manufacturers are also selling 3D TVs – they are banking on user-generated content partially filling the void until Hollywood produces more 3D Blu-rays. And that strategy may work: there are

already subcultures of 3D enthusiasts shooting everything from homemade 3D nature clips to 3D music videos and distributing them online.

As for the cameras themselves, there are several coming to market. I've tried several, and the experience is surprisingly fun – until it isn't. The rough patches have more to do with the half-evolved infrastructure of at-home 3D equipment and software than with the cameras themselves.

The cameras

➔ **Pricewise, 3D cameras** fall into two categories: For R10 000 to R20 000, you can get a full-feature 3D HD camcorder with optical zoom, high-end sensors and processors that can record at high bit

rates – which translate directly to higher video quality. These are available from camcorder stalwarts such as Sony, JVC and Panasonic. Below (R10 000), there are several easy-to-use 3D video cameras, but what you get varies from device to device.

The most straightforward of the cheaper bunch is the Sony 3D Bloggie, a camera that resembles the once popular but now defunct Flip video camera, but with two stereoscopic lenses. Primarily a 3D video camera, it can shoot 3D stills as well. Reversing those priorities is the Fujifilm FinePix Real 3D W3, a 3D still camera that can also shoot 3D video. Perhaps the weirdest device in the group is the HTC Evo 3D, a full-feature smartphone with integrated 3D camera that takes both still photos and video. If the (R10 000)-and-above 3D camcorders are analogous to SLR still cameras, then these more affordable cameras are comparable to pocket point-and-shooters.

Shooting in 3D

➔ **The most obvious outward sign** that you are using a 3D camera is the dual lenses. On the higher-end cameras, this usually results in a heavy lens array protruding from the front of the camera; on the less expensive point-and-shoots, the lenses are built into the camera body. If you're willing to get all sophisticated with your 3D cinematography, some of these cameras allow you to manually adjust parallax settings (by either digitally or physically changing the distance between lenses), which increases or decreases the 3D effect. But for everyday home movies, there's not a tremendous difference between the shooting technique for 2D and 3D video.

What is different is the way you view your footage. Almost all of these 3D video cameras are equipped with auto-stereoscopic screens, which let users view 3D images without the need for glasses, even while recording.

To achieve this, most cameras use lenticular screens, which have a thin film of small lenses, or lenticules, to direct the two versions of the video – the left and right perspectives – to each of the viewer's eyes. JVC's GS-TD1 and HTC's Evo 3D use slightly different technology – a parallax barrier screen – for their glasses-free 3D: A filter with precisely positioned slits occludes pixels intended for the left eye from the right eye, and vice versa.

Both technologies work surprisingly well. The Fuji W3's 90 mm screen elicited oohs and ahs from everyone I showed it to, and conveyed remarkable depth in

EQUIPMENT			
3D VIDEO CAMERAS BY THE NUMBERS			
			
System	JVC GS-TD1	Sony HDR-TD10	Panasonic HDC-SD800
Cost	R20 000	R15 000	R11 000 (with 3D-lens attachment)
Zoom	5x optical (3D), 10x optical (2D); 100x digital	10x optical (3D), 12x optical (2D); 160x digital	20x optical; 700x digital
Sensors	Twin 3,3 megapixels	Twin 2 megapixels	Triple 3,05 megapixels
Max bit rate	34 Mbps	28 Mbps	28 Mbps
Screen	90 mm parallax barrier 3D LCD	90 mm lenticular 3D LCD	75 mm 2D LCD
			
	Fujifilm FinePix Real 3D W3	Sony MHS-FS3 3D Bloggie HD	HTC Evo 3D
	R4 500	R2 500	Price not set
	3x optical	4x digital	4x digital
	Twin 10 megapixels	Triple 3.05 megapixels	Twin 5 megapixels
	Not specified	Not specified	6 Mbps
	90 mm lenticular 3D LCD	61 mm 4 parallax barrier 3D LCD	110 mm parallax barrier 3D LCD

spite of its modest size. But extended use revealed its shortcomings. These displays are temperamental, and viewers' eyes need to stay in a narrowly determined area for the effect to work. Moving a couple of centimetres to the side or tilting the screen a few degrees can turn the image into a fragmented mess or a dark blur; showing it to others basically requires you to give them a crash course in autostereoscopy. And even a well-adjusted screen strains the eyes with sustained use. A poorly adjusted screen? Instant headache. Plus, none of these manufacturers has created 3D menus, so the onscreen information gets layered over the 3D image in a way that destroys the effect and can unsettle the stomach.

Big-screen options

➔ **Truly enjoying 3D video** means sending it to a larger display. Unfortunately, as soon as 3D footage leaves the camera, things start to get complicated.

Most of the new generation of 3D cameras are equipped with HDMI outputs, which let them connect directly to any 3D HDTV. To view your video and photos on the big screen, however, requires using your set's 3D active-shutter or polarised glasses. On a modern 3D HDTV, the resulting effect is profound, albeit limited: vividly defined subjects – nearby people, layered vegetation, a closely passing car – will contrast with their backgrounds with distinct depth, producing a sensation remarkably close to that of viewing a big-budget 3D film in a cinema.

There are some peculiarities. When

viewed on a big screen, shots I took of Lower Manhattan from across the East River conveyed disappointingly little depth. Footage I took of friends playing soccer against the backdrop of a wide-open park left them looking flat, giving the scene a paper-cutout aesthetic. (Though, to be fair, this problem was more pronounced on some 3D displays than others.) Filming from too short a distance forces parts of the frame out of focus, breaking the 3D illusion entirely.

Then there's the image-quality issue. Many of these cameras can capture 3D in HD, but the video quality is noticeably lower than full HD when displayed on TV, a consequence of the two video streams being stored side by side in the same HD video file.

Editing and sharing

➔ **Like most cameras**, these 3D shooters ship with PC software capable of performing light editing work. These simple programs are focused on cutting and sharing, so for serious home moviemaking, something more powerful is required. So far, neither of the operating systems' freebie movie editors – Windows Live Movie Maker and Apple's iMovie – supports 3D, which means you'll need an editing suite such as Roxio Creator or Magix Movie Edit Pro for fancy effects such as 3D fades and titles or for burning your masterpiece to a DVD. (For the time being, recording your own 3D Blu-ray discs is out of the question.)

Like TVs, few computers are set up for 3D duty. To display 3D natively with a PC, you need serious graphics power, a special



Visit www.popularmechanics.co.za to see what James Cameron has to say about 3D movies and his award-winning movie, *Avatar*.

high-refresh screen and active-shutter glasses. Sharing your videos presents a new set of challenges – it's unlikely that Grandma has a 3D TV or computer available to watch Junior's first stereoscopic steps.

But YouTube has a dedicated 3D channel that offers some innovative work-arounds. The site lets users upload split-frame, side-by-side 3D video. Then users can choose one of three ways to watch it. If you do, indeed, have a 3D-capable monitor, YouTube will output the side-by-side video and let your equipment interpret it. The site's bicolour anaglyph mode preserves the 3D effect and can be viewed with any old pair of red-and-blue cardboard 3D glasses, but it severely tints the video's colours. YouTube also has a cross-eyed display option that requires no glasses at all, just some eyeball gymnastics. It produces decent results, but the drawbacks are as painful as they are self-evident. Asking someone to do this for more than a minute is a good way to make them despise 3D forever. So, there are plenty of options for 3D viewing, even if none of them is perfect. But there's one more nice aspect to 3D video – if you don't feel like watching your videos in 3D, you can always remove one of the stereoscopic views and, voilà, the world is comfortably flat all over again.

PM

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Driver distraction



A modern F1 car has a movable rear wing, electric-hybrid boost, adjustable differential and clutch, and even dials that affect the engine's torque curve. It's the most technologically sophisticated race car on the planet, so naturally it's got an equally complex steering wheel that's jammed with enough switches and dials to make an airline pilot cross-eyed. Here's a breakdown of the controls F1 drivers constantly adjust – while battling other cars at 300 km/h. – BY LARRY WEBSTER



1 BOOST ▶ F1 cars have an electric-hybrid system known as KERS (Kinetic Energy Recovery System) that regenerates braking energy, then boosts acceleration – at the push of a button – via a 60 kW electric motor. Another feature that increases speed is the movable rear wing that flattens to reduce drag. The wing is controlled by a foot pedal.

2 LAP TIME

3 HARVEST ▶ Regulates the amount of energy “harvested” during braking. The regen system can alter the feel of the brakes, and because these guys drive with exacting precision, they’re picky about tactile feedback. This knob lets them customise.

4 DOWNSHIFT PADDLE

5 MIX ▶ Adjusts the engine's air-fuel mixture to balance power and fuel economy. F1 cars don't refuel during a race, but economy is still vital – fuel adds weight.

6 BITE POINT ▶ The race start is critical because the cars begin from a stop and the initial sprint is a prime overtaking opportunity. The bite point adjusts how the clutch engages as the drivers release the paddle, so they can execute a perfect launch.

7 BPF ▶ During practice starts, the driver uses the “bite point find” to record the clutch behaviour. Engineers use the data to instruct the driver where to set the bite point dial.

8 CLUTCH PADDLE

9 BBAL ▶ Displays the front-rear brake balance, a critical adjustment that drivers make to fine-tune the braking performance. Most passes are done in the braking zones.

10 REVERSE GEAR

11 SHIFT LIGHTS

12 LIMITER ▶ Restricts the car's speed to the pit-lane limit, 100 km/h.

13 ENGINE PARAMETERS

14 UPSHIFT PADDLE

15 TORQUE ▶ The 2.4-litre V8 revs to 18 000 r/min and delivers north of 520 kW. That's a handful in a 635-kg car, so the drivers use this knob to adjust the engine's torque curve, depending on track conditions.

16 TYRE ▶ Teams use roughly half a dozen different tyres that vary in construction and diameter. This dial tells the computer which tyres are fitted so it can calculate wheel speed.

17 CLUTCH PADDLE

18 DIFFERENTIAL ▶ Thanks to electronic controls, the characteristics of the rear differential can be tailored for corner entry, midpoint and exit – each with 12 settings. Frankly, we're amazed that the drivers can detect such minute rear-end differences during cornering events that last for maybe a few seconds. But that's why they're paid millions. **PM**



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Fighting R10 fuel

We test fuel-saving driving tactics.

> BY MIKE ALLEN

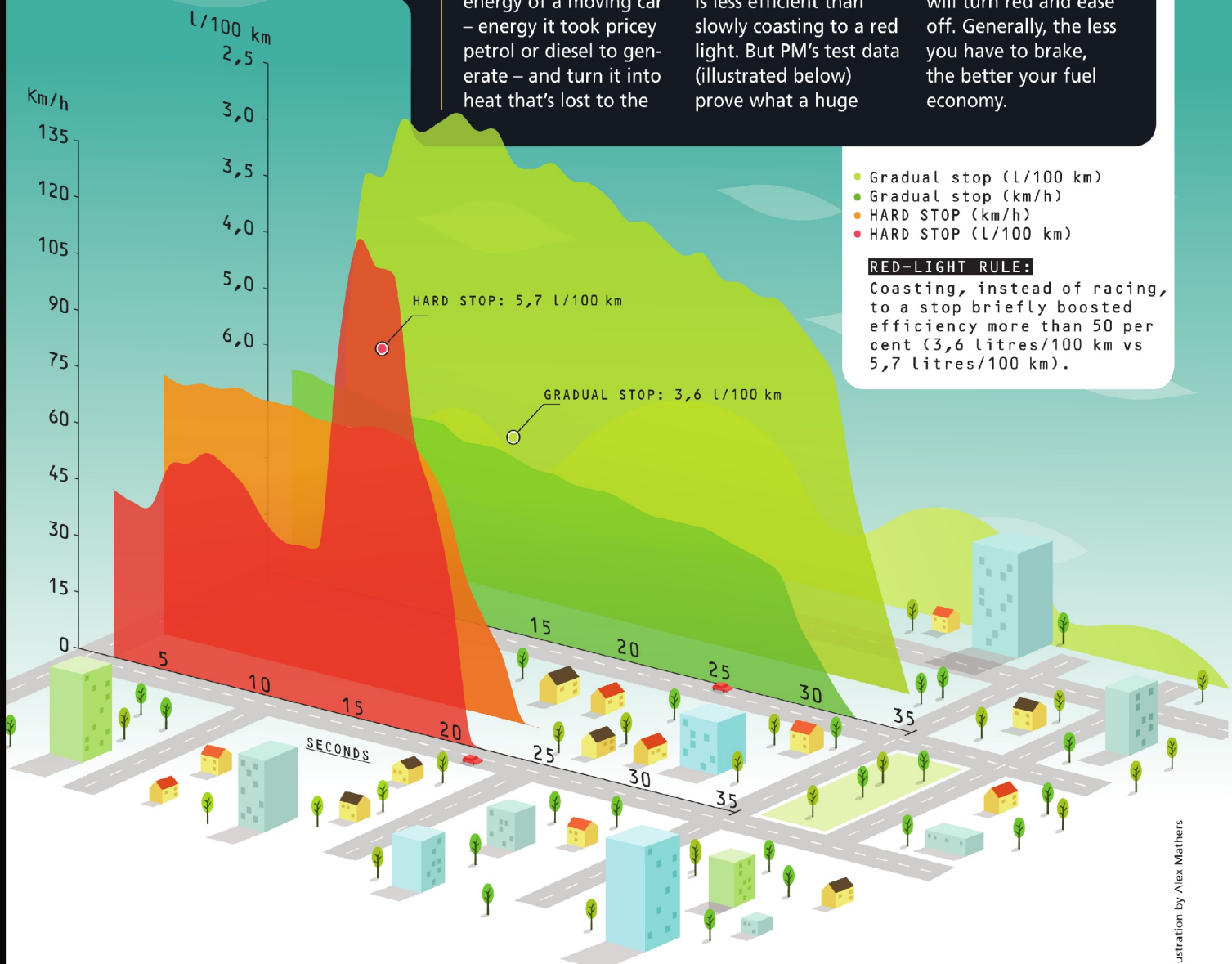
➔ **Fuel is expensive.** In fact, it's close to historic highs, and drivers are trying to find ways to conserve fuel – and protect their wallets. Fortunately, there are ways to save that don't involve buying a hybrid car, or sitting at home. Recent *POPULAR MECHANICS* testing proves what many have argued: that modifying how you drive can boost fuel economy. But not all of the conventional advice is right. To separate efficiency truths from myths, we outfitted an ordinary set of wheels (a 2001 Suzuki Grand Vitara; odometer reading 177 000 kilometres) with a precise fuel-economy sensor, and then started driving. The conclusion: if a formerly lead-footed driver employs the tactics presented here, he could save up to 10 per cent – that's hundreds of bucks a year. So ease off the pedal, and let's dive into the data.

TACTIC NO 1 Coast to a stop

Brakes are necessary (duh!), but they're inherently wasteful: They take the kinetic energy of a moving car – energy it took pricey petrol or diesel to generate – and turn it into heat that's lost to the

air. Everyone knows that accelerating until the last moment then braking hard to stop is less efficient than slowly coasting to a red light. But PM's test data (illustrated below) prove what a huge

difference coasting makes. The lesson: whenever possible, anticipate that a light will turn red and ease off. Generally, the less you have to brake, the better your fuel economy.



TACTIC NO 2**Close windows and use a/c at high speeds**

the option of sweating it out.) PM's testing settled the issue. Driving at 90 km/h with the a/c running, we got 9,84 litres/100 km; turning it off dropped us down to 8,43 litres/100 km. Then we opened all four windows, one at a time, and increased by 0,35 litres/100 km per window until we were back at 9,84 litres/100 km. So at that speed, it's a wash. But aerodynamic drag rises exponentially with speed – the faster you go, the more the open windows hurt efficiency. The answer? Below 90 km/h, open the windows and leave the a/c off. But at 100 km/h or higher, keeping them closed and the air conditioning running will burn less fuel.

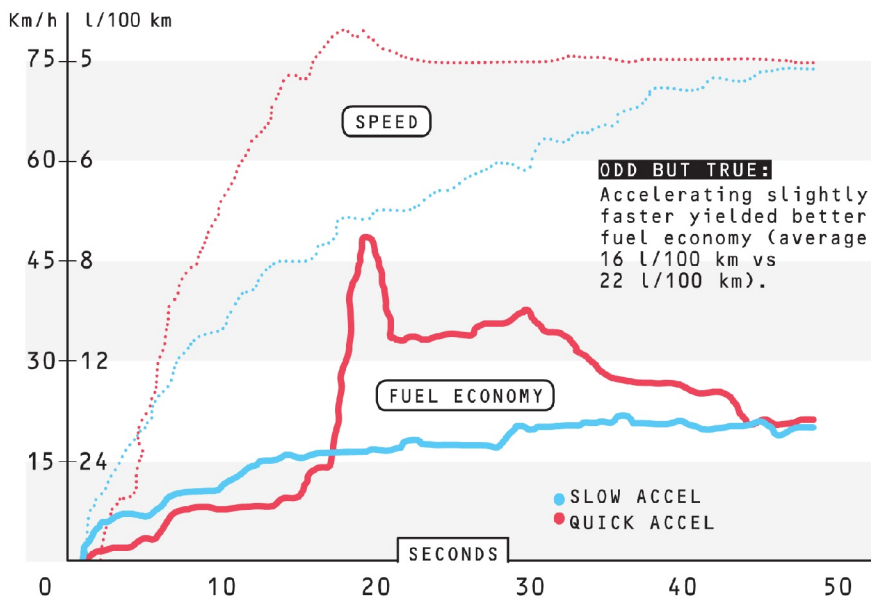
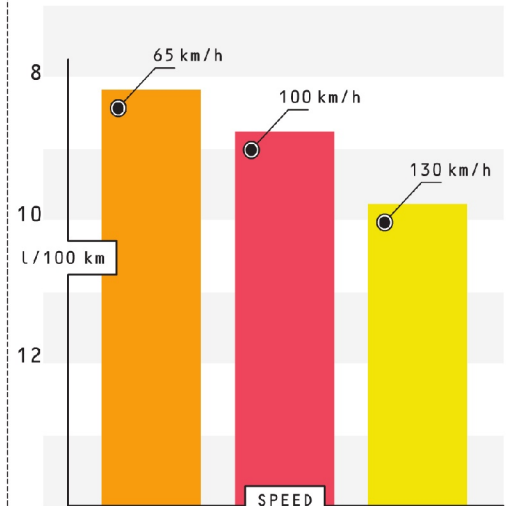
It's a fierce efficiency debate:

open the windows in summer to avoid running your energy-intensive air conditioner, or keep the windows closed and the a/c on to preserve your car's aerodynamic profile. (We'll leave aside

TACTIC NO 3**Avoid slowly crawling up to speed**

ating too slowly prevents upshifting at an efficient rate. The best acceleration rate varies with the vehicle, gear ratios and weight. But in our testing we found that taking 15 seconds to accelerate to 80 km/h used less fuel than taking 30 seconds to reach the same speed, because the car entered its top, fuel-saving gear sooner.

Conventional wisdom says that jack-rabbit starts consume more fuel. But it turns out that nursing your speed up to the limit too slowly also boosts consumption. How can that be? Cars get poorer fuel economy in lower gears, and acceler-

**TACTIC NO 4****Cruise at a slower speed**

Since the power required to overcome aerodynamic drag is a function of the velocity cubed (in other words, it shoots up quickly), a car's jump from 65 to 100 km/h requires less fuel than the increase from 100 to 130 km/h. (As the graph above shows, the hit to fuel efficiency is roughly twice as severe in the higher range.) So go slower, right? Well, yeah, but fuel efficiency isn't the only thing that matters. Some studies suggest that, in the USA, the old 55-mph (88 km/h) limit saved fuel but cost more in terms of lost work hours. Then there's safety: going 90 km/h when traffic is cruising at 120 can be dangerous to everyone. Just don't go 130. That will drain your tank quickly – and the costs add up if you also have to pay for a speeding ticket.

FUEL-SIPPING BASICS**Monitor tyre pressure**

➔ Keep your tyres properly inflated, because low pressure increases rolling resistance. Few drivers check and adjust their tyre pressure often, but it's a good idea to do it once a week.

Plan errands carefully

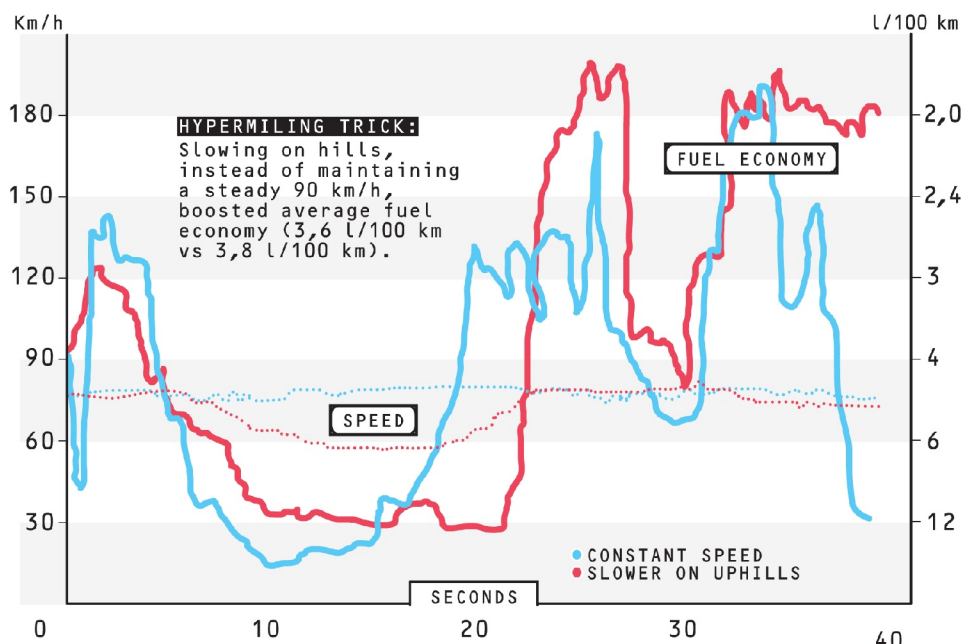
➔ Reduce the distance you drive by running all your errands in one trip. Making a run to the dry cleaners and then picking up the kids after soccer practice? Don't make separate outings. A little bit of foresight will stretch your fuel economy.

Warm up the engine

➔ Cars get better fuel economy when the engine is warm. So if you have a three-stop run, hit the farthest destination first, then work your way back home. A fully warmed-up engine will remain at an efficient temperature even if it's parked for half an hour.

Make left turns only

➔ The MythBusters proved the principle works: when city driving, make as many left turns as possible, even if it means going a few hundred metres out of the way. Reducing loiter time – or idling while waiting for traffic to clear – saves fuel.



TACTIC NO 5 ▲

Climb slowly (when it's safe)

Imagine driving on a flat highway and approaching an overpass. From a fuel-efficiency standpoint, the best strategy is to turn off cruise control and forget about maintaining a constant speed up and down both sides of the grade. The theory predicts that, and our data prove it. The physics work like this: lifting off the accelerator while travelling up the hill and allowing your speed to decay trades some kinetic energy (related to speed) for potential energy (related to the car's tendency to roll downhill). You regain the kinetic energy – and get better economy – on the backside. Whereas hypermilers – who are obsessed with getting the best possible economy – claim significant benefits from this technique, our results showed only modest gains. Two things did happen, though: (1) We drew the wrath of a lot of drivers following us, as evidenced by their single-finger salutes; (2) We were nearly sideswiped by an impatient 18-wheeler. Yes, the method does work. But we'll save it for lightly travelled roads.

POPMECH TEST TOOLS



To develop the best tactics for fuel-efficient driving, we instrumented our car, then hit the road. To settle the long-standing question of whether it's better to coast along in neutral or in gear, we tapped into the fuel injection harness on the engine, hooking up to an oscilloscope to capture the opening and closing of the injector. For most of the other tests, we used Palmer Performance Engineering's Dash-Command and ScanXL Pro software running on a generic Windows netbook computer, with Palmer's cable plugged into the OBD-II port under the dash.

TACTIC NO 6

When coasting downhill, leave the car in gear

There are those who refuse to be shaken from the practice of coasting downhill in neutral to save fuel. This is a bad idea no matter how you look at it. Let's set aside fuel economy for a moment. Coasting downhill in neutral is dangerous. In neutral, you have no way to accelerate to avoid a hazard, and if the engine stalls, you have no power steering or vacuum boost for the brakes. If the hill is steep enough to call for hitting the brakes to keep you from gaining speed, they're more likely to overheat – and overheated brakes lose effectiveness until they cool off. They'll probably do that right around the time the police show up to take the accident report.

Here's the surprise: there's no trade-off between safety and fuel economy in this case. Leaving the car in gear while coasting downhill actually is more efficient. Why?

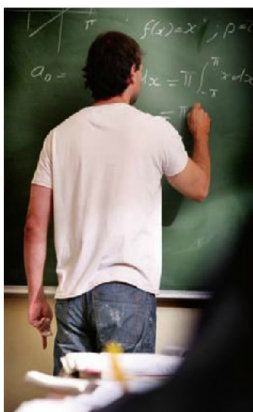
Most fuel-injected engines today use computer-controlled deceleration fuel cut-off: when you lift your foot from the accelerator pedal while leaving the car in gear, injectors shut off automatically, and the car's rotating tyres – which are connected to the engine via the transmission – keep the engine turning and the accessories running. So, the engine consumes no fuel at all while the vehicle is coasting downhill.

In contrast, the fuel-consumption rate for a petrol engine idling in neutral falls between 0,8 and 1,6 litres per hour (l/h). Splitting the difference and using 1,2 l/h for our example, idling in neutral down a 1-kilometre hill consumes fuel for 30 seconds, for a total of about 10 ml of fuel. Popping the car into neutral actually wastes fuel.

This may seem counterintuitive, but that's what data are for – replacing good guesses with solid facts. Watch the data, and over time the savings will take care of itself.

PM

Philip Friedman/Studio d



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- Prof Mamokgethi Setati,
Executive Dean

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CAR CARE

Q+A

> BY MIKE ALLEN



This battery maintainer will take a very long time to recharge this deep-cycle battery, but will keep it at peak state of charge without killing it.

Time to charge

Q During the winter, I've always used a trickle charger to keep my motorhome's battery charged. I discovered that, if I put it on a timer so it only ran an hour or two a day, I didn't have to add water every month. Last summer I replaced the battery with a pretty expensive AGM one that doesn't have ports for adding water. I also neglected to use the timer. Now the new battery won't hold a charge or start the motor, and the guy who sold it says I have to buy an expensive charger to keep it alive over the winter.

A The problem isn't your AGM battery; it's your old-tech charger. It's essentially a constant-voltage device, providing about 14 volts regardless of the battery's

state of charge. A really dead battery might pull the output down to a more appropriate 13,2 volts or so, but, ultimately, as the battery charges, the voltage rises and

overcharges. With your old-fashioned flooded-cell battery, it wasn't a big deal – as the distilled water was electrolysed to hydrogen and oxygen and evaporated, you simply topped it off every now and then. Putting the charger on a timer like you did is brilliant, because that strategy proportionally reduces overcharging and the rate of evaporation.

Modern maintenance-free batteries have no filler caps – and thus no way to add water, so it's vitally important to avoid overcharging. And AGM-class batteries are even more advanced. AGM stands for Absorbed Glass Mat: the sulphuric acid electrolyte is soaked into a porous glass fibre mat, and additional chemistry inside the battery recombines the hydrogen and oxygen back into water, making these truly maintenance-free devices.

Until you overcharge one with a constant-voltage trickle charger, of course. Your first step is to give that old trickle charger to someone you don't like – and get a modern battery maintainer. These devices generally have three or more charging phases and are designed to be used full time.

They start by assessing the battery's charge state, then charge at a constant voltage (like your trickle charger) up to 80 per cent of the battery's capacity and finally taper off to slightly above the nominal 12,6 volts to avoid overcharging.

Periodically the smart charger checks the battery's state of charge and briefly ramps up the voltage to replace any energy lost during the battery's normal self-discharge. Some even include a desulphation mode to break up any lead sulphate crystals growing on the plates, another problem caused by normal use and exacerbated by chronic undercharging.

I have probably a dozen battery chargers and maintainers lying around the workshop, ranging in cost from a few bucks to several hundred bucks. Assuming your motorhome's battery is fully charged by the engine alternator when you park it, the smallest ones (around 1 amp) should do the job. Some larger chargers which have a maintainer function and are rated at 6 or 10 amps will actually recharge a decent-sized battery from dead overnight – without cooking the water out. They're great for things such as trolling-motor batteries that need regular recharging. Maybe that's what this fellow is trying to sell you; otherwise, look for a device in the R150 to R300 range that should be available from several suppliers.

Shifty

Q My first car had a manual shift, like the car I now own, a 1988 Porsche 944. My dad always taught me to downshift to slow down. He says that I'm saving brakes, and as long as I bring the revs up before downshifting, I won't harm anything. Is this technique better or more efficient than relying solely on the brakes?

A Define "efficient". A skilled driver can match revs and double-clutch a manual gearbox, avoiding premature wear on the synchros and gearsets to achieve smooth deceleration. I do this all the time – but it's not to help out the brakes. I do it to make sure the transmission is in the correct gear for the eventual acceleration.

A racing driver once told me that brakes are a lot cheaper than engines and transmissions, and that, when he needs to slow down, he's not above doing all the braking with his right foot while he skips gears downshifting. I happen to agree with him.

Cracked in circles

Q I have a 1997 Honda Accord with 232 000 km on the clock that's in excellent condition. I intend to keep it for another 150 000 kilometres. There's about a 2 cm circular crack near the base of cylinder No 2 exhaust manifold where it joins the exhaust port. Is there a repair method for a cracked manifold, please?

A You've neglected to tell me whether your Accord has the four-cylinder or V6 engine: the four-banger has a fabricated manifold welded to steel flanges;

the V6 manifolds are cast-iron. Actually, it doesn't matter – buy new parts instead of trying to fix them.

I have repeatedly attempted to repair cracked exhaust manifolds, generally with middling success. Welding cast iron is tricky. It requires a skillful welder who has experience welding cast iron, and careful pre-heating and after-cooling of the manifold. Similarly, properly welding the stamped-steel manifolds is difficult, because years of exhaust gases have contaminated the metal to the point where getting a good bead along the crack will be difficult. Regardless of the material they're made from, repeated heating and cooling cycles have made the metal brittle. If you elect to try welding, this means removing the manifold from the vehicle. There is often enough distortion introduced by the welding that the nearby sealing flange will need to be remachined to seal properly.

Odds are that one of the other runners will crack soon after you get the whole thing back together – and please don't ask how I know.

If you need to remove the manifold to do all this – which is not that simple, as the bolts invariably are difficult to remove – you might as well put on a new manifold.

Uplifting

Q In regard to "Running on Empty" in a recent Car Clinic, I have an easier solution for replacing the fuel-tank sender/fuel pump combo. A couple of years ago I encountered the same problem – an erratic fuel gauge.

It would have cost thousands to have a

workshop replace the pump and sender. Instead, I bought the pump and installed it myself. However, I didn't have to remove the tank. Because my vehicle is a pick-up, you can simply remove the bed by taking out six or eight bolts, unplugging the taillights and removing the fuel-filler neck. All in all, it took less than a couple of hours, and I didn't have to hoist the vehicle up like you would when removing the tank.

A Actually, you don't even have to completely remove the bed. Just tilt it forward enough to get access to the tank. Be careful not to let the bed bash in the back of the cab. And you'll need an overhead winch or a half-dozen stout friends to lift the bed clear. Prop it up carefully so you don't get squashed while working under there.

Size matters

Q My car is a 2005 Cadillac STS. It has P235/50R-17-size tyres on the front and P255/45R-17 on the back. Can I put front-sized tyres on all four wheels? Is that safe? Will they fit on the wheels? Any adverse effect on handling?

A Yes. No. Yes. And, oh, yes. Changing the tyre size will have, umm, unpredictable effects on the car's handling. Your car's spring, shock and antiroll bar rates were tuned for a specific tyre diameter and sidewall compliance. Tinker at your peril. I predict extra oversteer, in spite of the yaw control system.

I know I'm going to get letters from readers who have done similar swaps without perceived ill effects. I don't care. **PM**

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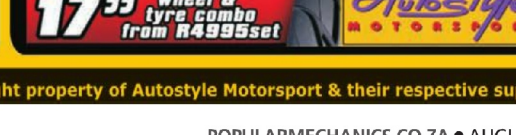
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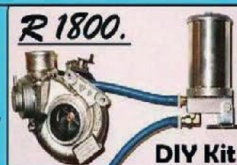


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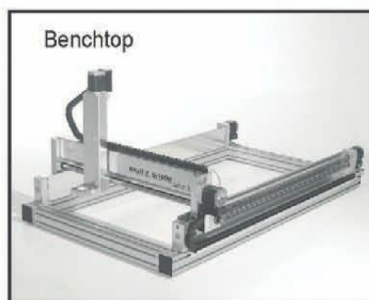


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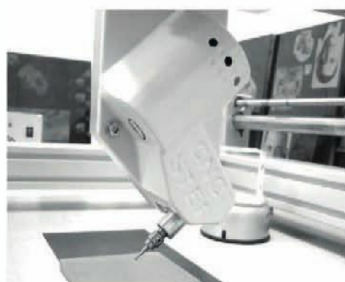
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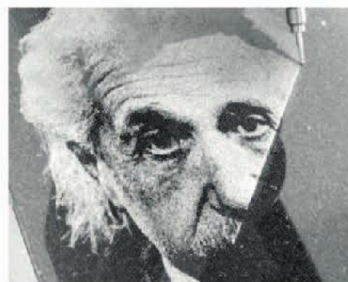
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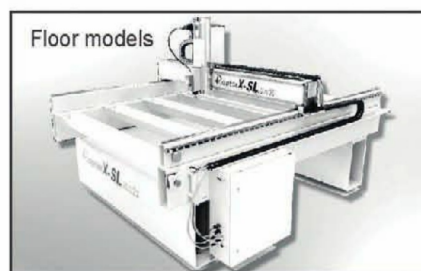
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MICHAEL QUAYLE
PIETERMARITZBURG

A question of aesthetics

Sometimes, when repairing or restoring old and antique furniture, joining pieces of timber with screws may not be the best option because the screw holes are enlarged, and a larger screw may not be aesthetically desirable. An alternative solution is to glue the parts together, then drill a 5-6 mm hole through the parts to be joined, squeeze in some wood glue, and hammer in a normal wooden golf tee (of the long, natural timber type). Allow to dry, cut off the

top of the golf tee with a wood chisel or Stanley knife, and sand lightly until smooth. You will be left with a perfect timber joint in a natural timber colour.

DICK VAN STRAATEN
SUNNINGHILL

Catch them in the act

After a very near miss on Hospital Bend (Cape Town) when a car cut in front of me before braking hard, I wondered how, if there had been an accident, I would have been able to prove who was at fault. The answer: simply attach a cellphone to the rearview mirror (I use Prestik) and set it to record video when you set off. It's good for 1,5 hours of video on my phone, and the peace of mind is very reassuring.

BOB SEDDON
PLUMSTEAD

Editor's note: This tip may sound mildly paranoid, but having been a victim of another driver's incompetence on the same section of highway, I'm convinced.

Out, damned spot

Most workshops and driveways seem to be defaced by an oil stain, an eyesore that's almost impossible to remove without scrubbing and hard labour. Here's my solution: first, spray the oil spot with water (a recycled window cleaner bottle

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would do fine). Next, sprinkle caustic soda flakes evenly across the oil spot, taking care to cover only the stain: use one tablespoon (15 ml) to treat a spot 30 cm across.

Spray with water a second time to properly wet the flakes and allow to stand for 24 hours. Spray again the next day, and again a fourth time. After three days, use a hose to wash away the debris. Warning: make sure that pets and children do not come into contact with the treated oil spot until the caustic soda has been rinsed away. If the stain persists, repeat the process until it disappears.

DEREK BOTHA
PRETORIA PM

Ace in the hole

If you over-drill a hole, especially in old and powdery brickwork, you may find that the screws either don't grip or grip unevenly. Rather than buy a proprietary chemical anchor (which tends to be expensive, and isn't readily available in volumes suited for domestic use), I squish some Pratley putty into the hole. Next, I insert the jacketed screw, 70 per cent screwed into its jacket. I set the screw angle, allow it to set, then screw it in all the way. It's important that you don't fill the gaps completely with putty, or there will be no space left for the expanding jacket to move. This solution allows you to hang heavy items on powdery walls.

MATTHEW FRIEDLAND
CRAIGHALL PARK

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Let's find South Africa's Inventor of the Year!

 **INVENT**
Popular Mechanics 2011

With two highly successful events under our belt, it's time to expand the annual **Popular Mechanics Inventors Conference** into something bigger, better and decidedly different. Say hello to **INVENT 2011**, an ambitious and wide-ranging project with two primary aims: to assemble some of the country's most fertile minds at an inspiring, mind-stretching conference, and to identify South Africa's "Inventor of the Year".

In the coming months, we will evaluate entries in two divisions, Industry Awards and General Awards. A single person will be chosen by a panel of judges to win the title of South African Inventor of the Year.

In the **Industry Awards** division, the three categories are: **Consumer Tech, Automotive and Science**. Our panel of experts will nominate a short list of candidates in this division.

In the **General Awards** division, the categories are: **Stepping Up** (high schools), **Breaking Ground** (university students), **Emerging Genius** (previously disadvantaged and minimally resourced entrants), **Going Green** (for inventions in the field of sustainable energy and environmental conservation), and **Cutting Edge** (the last two categories are open to the general public).

The rules are logical without being arduous: for example, the invention should be genuinely original, and must have the potential to make money or improve life on Earth. **Entrants** will also be asked to describe their target market, business plan and related strategies. **The winners** in each category will be honoured at a formal event on the evening of the PM Inventors Conference, after which we'll name South Africa's Inventor of the Year.

What's your next step? Look out for our announcements on entry criteria and other details – delivered via our Web site (www.popularmechanics.co.za), our Facebook page, our weekly newsletters ("The Cutting Edge") and other media channels during the coming weeks and months.

The one-day PM Inventors Conference takes place in **Johannesburg in November 2011**, and the fee is R1 000 (or R850 for "early bird" respondents). **Watch this space.**

Now's your chance to mingle with like-minded inventors and be inspired to change the world!



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